VOL. XXXV. PART 1 JANUARY, 1956
(*Issued February 1956*)

THE REVIEW
OF
APPLIED MYCOLOGY

Compiled from
WORLD LITERATURE ON PLANT PATHOLOGY
AND APPLIED MYCOLOGY

THE COMMONWEALTH MYCOLOGICAL INSTITUTE
KEW, SURREY

Price 6s. net

PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, OXFORD, BY CHARLES BATEY, PRINTER TO THE UNIVERSITY

THE REVIEW

OF

APPLIED MYCOLOGY

Vol. XXXV

ISSUED BY THE COMMONWEALTH
MYCOLOGICAL INSTITUTE

THE COMMONWEALTH MYCOLOGICAL INSTITUTE
KEW, SURREY

1956

COMMONWEALTH MYCOLOGICAL INSTITUTE

EXECUTIVE COUNCIL

C. E. LAMBERT, C.M.G. (*Chairman*), Colonial Territories; T. SWAMINATHAN, I.C.S. (*Acting Vice-Chairman*), India; W. C. TAME, United Kingdom; J. G. MALLOCH, M.B.E., Ph.D. (*Acting*), Canada; A. SHAVITSKY, Australia; V. ARMSTRONG, Ph.D., New Zealand; E. D. ANDREWS, Union of South Africa; (*Vacant*), Pakistan; V. M. ABEYSEKERA (*Acting*), Ceylon; J. E. C. COVENTRY, B.A., M.Sc., Federation of Rhodesia and Nyasaland.

STAFF

Director and Editor: J. C. F. HOPKINS, D.Sc., A.I.C.T.A. *Assistant Director*: H. A. DADE, A.R.C.S. *Mycologist*: E. W. MASON, O.B.E., M.A., M.Sc. *Assistant Editor*: GRACE M. WATERHOUSE, M.Sc. *Plant Pathologist*: R. A. ALTSON, B.Sc., A.R.C.S. *Assistant Mycologists*: M. B. ELLIS, Ph.D.; F. C. DEIGHTON, O.B.E., M.A.; C. BOOTH, M.Sc.; AGNES H. S. BROWN, Ph.D. *Sub-Editors*: E. B. MARTYN, B.A.; D. JEAN STAMPS, Ph.D. *Colonial Pool of Plant Pathologists*: P. HOLLIDAY, M.A.; B. E. J. WHEELER, Ph.D.

COMMONWEALTH AGRICULTURAL BUREAUX LIAISON OFFICERS

UNITED KINGDOM: W. NESS, The Agricultural Research Council, Cunard Building, 15 Regent Street, London, S.W. 1.

CANADA: H. L. TRUEMAN, B.S.A., Foreign Agricultural Relations Office, Department of Agriculture, Ottawa, Ontario, Canada.

AUSTRALIA: W. IVES, M.Ec., Commonwealth Scientific and Industrial Research Organisation, 314 Albert Street, East Melbourne, C.2, Victoria, Australia.

NEW ZEALAND: N. A. MARRIS, M.Sc., Department of Scientific and Industrial Research, Wellington, C. 1, New Zealand.

UNION OF SOUTH AFRICA: S. POTGIETER, c/o Secretary for Agriculture, Agriculture Buildings, P.O. Vallis, Pretoria, Transvaal, Union of South Africa.

INDIA: M. S. RANDHAWA, M.Sc., F.N.I., I.C.S., Vice-President, Indian Council of Agricultural Research, Multistoreyed Building, Queen Victoria Road, New Delhi, India.

PAKISTAN: TASKHIR AHMAD, Ph.D. (Cantab.), Director, Department of Plant Protection, Government of Pakistan, Karachi.

CEYLON: R. W. WIKRAMANAYAKE, C.C.S., Assistant Secretary, Ministry of Food and Agriculture, Colombo 2, Ceylon.

FEDERATION OF RHODESIA AND NYASALAND: G. R. BATES, Ph.D. (London), Chief Botanist and Plant Pathologist, Department of Research and Specialist Services, P.O. Box 8100, Causeway, Southern Rhodesia.

COLONIAL TERRITORIES: G. W. NYE, C.M.G., O.B.E., B.Sc. (Agr.), C.D.A., Agricultural Adviser to the Secretary of State, Colonial Office, Sanctuary Buildings, Great Smith Street, London, S.W. 1.

REPUBLIC OF THE SUDAN: The Chief of the Research Division, Department of Agriculture and Forests, Wadi Medan, Sudan.

REPUBLIC OF IRELAND: S. M. BREATHNACH, Department of Agriculture, Dublin.

PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, OXFORD
BY CHARLES BATEY, PRINTER TO THE UNIVERSITY

ERRATA

VOLUME XXXIII

page 580 line 43 for 'M. Klinkowski' read 'E. Kohler'
51 insert 'M. Klinkowski and' after 'compiled by'
701 45 for 'HUERTOS (M. R.)' read 'RUBIO HUERTOS (M.)'

VOLUME XXXIV

310 30 insert '[*Nectria inventa*]' after '*Verticillium cinnabarinum*'
340 41 for '**31**, p. 545' read '**32**, p. 545'
354 16 insert 'Pichilingue, Ecuador' after 'Tropical Experiment Station'
28 insert 'in Costa Rica' after '*P. palmivora*'
375 8 for 'russetting' read 'russeting'
407 10 for '[*O. taurica*]' read '[*Leveillula taurica*]'
460 22 for 'black spot of Japanese pear (*Alternaria kikuchiana*)' read 'black spot (*Alternaria kikuchiana*) of Japanese pear [*Pyrus pyrifolia*]'
560 42 for '*Cadophora*, *Lecythophora* [*Phialophora*]' read '*Cadophora* [*Phialophora*], *Lecythophora*'
635 13 for 'W. Fukes' read 'W. Feekes'
851 23 for '375' read '373'
867 44 for '*Botrytis tulipae* on onion in U.S.A., 17, 322; control 607; in relation to "blast", 17.' read '*Botrytis tulipae* on onion in U.S.A., 17; in relation to "blast", 17. *Botrytis tulipae* on tulip in U.S.A., 322; control, 607'.
868 15
909 26 } for 'Costa Rica, 354; Ecuador, 22.' read 'Ecuador, 22, 354.'
921 72
969 55 } for 'Nyasaland, 732; U.S.A., 97, 379;' read 'U.S.A., 97, 379, 732;'

VOLUME XXXV

44 52 insert '[*Pyrenophora*]' after '*Helminthosporium*'
46 17 for '*Oxyporus nobillissimus*' read '*Oxyporus nobilissimus*'
66 46 for '*Pyrenochaete*' read '*Pyrenochaeta*'
80 9 for '*Anona*' read '*Annona*'
90 25 for '**35**, p. 76' read '**35**, p. 78'
145 32 for '*Pseudomonas lachrymans*' read '*Pseudomonas lacrymans*'
154 11
12 } for '1953' read '1954'
166 45 for '700' read '100'
181 2 for 'pp. 1–3, 43–53' read '1–3, pp. 43–53'
182 2 for 'proto-basidomycetes' read 'proto-basidiomycetes'
214 20 for '*Sclerotium sclerotiorum*' read '*Sclerotinia sclerotiorum*'
228 28 for '*Echinochloa colona*' read '*Echinochloa colonum*'
253 18 for '*Phyllostachis*' read '*Phyllostachys*'
296 21
23 } for '*Heliothes*' read '*Heliothis*'
301 9 for 'ROJAS EMILIO (M.)' read 'ROJAS M. (E.)'
310 30 for 'SIJPESTEYN' read 'SIJPESTEIJN'
319 10 for '37' read '34'

VOLUME XXXV (*continued*)

page 328 line 34 for '*Cercospora kopkei*' read '*Cercospora koepkei*'

340 41 for '**31**, p. 545' read '**32**, p. 545'

351 2 insert '[*L. anagyroides*]' after '*Laburnum vulgaris*'

359 16 for 'Turrialba, Costa Rica', read 'Quevedo, Ecuador'

363, 669 14, 46 insert '[barley stripe mosaic virus]' after 'barley false stripe virus'

378 49 for '*Gymnosporangium juniperae-virginianae*' read '*Gymnosporangium juniperi-virginianae*'

397 14 for 'pear' read 'pea'

14 insert '[*S. cannabis*]' after '*S. cannabina*'

418 31 for '[loc. cit.]' read '**35**, p. 157'

431 9 for 'LEONORI-OSSINICI' read 'LEONORI-OSSICINI'

443 40 for 'Winterroggeni m' read 'Winterroggen in'

482 49 insert '[*C. psoraloides*]' after '*tetragonoloba*'

494 37 for 'agromycin' read 'agrimycin'

499 11 for '*Juniper*' read '*Juniperus*'

501 41 for '*Atriplex hortense*' read '*Atriplex hortensis*'

528 1 for 'DURBIN (R. C.)' read 'DURBIN (R. D.)'

605, 699 53, 29 for '*Hormodendron*' read '*Hormodendrum*'

644 9 for '*Cryptodiaporthe castaneae*' read '*Cryptodiaporthe castanea*'

13 insert '[*Didymascella*]' after '*Keithia*'

55 for '*Chaemacyparis*' read '*Chamaecyparis*'

654 29 for '*Stysanus stemonitis*' read '*Stysanus stemonites*'

661 44 for '42' read '165'

663 39 for '422' read '427'

676 29 for '*P. funicolosum*' read '*P. funiculosum*'

680 29 for '*Holcus lanata*' read '*Holcus lanatus*'

681, 771 9, 17 for '[*Calonectria graminicola*]' read '[*Calonectria nivalis*]'

688 23 insert '[strain of peach western X virus]' after 'peach yellow leaf roll virus'

36 delete '[strain of peach X virus]'

719 25, 28 for '*Claviceps litralis*' read '*Claviceps litoralis*'

748 42 insert '[*P. parasitica* var. *nicotianae*]' after '*Phytophthora nicotianae*'

758 9 for 'including' read 'except'

813 51 for 'H. KLINKOWSKI' read 'M. KLINKOWSKI'

838 5, 7, 9 for 'antimycin' read 'actinomycin'

914 24 delete '[*R. nigricans*]'

COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XXXV JANUARY 1956

RAGETLI (H. W. J.) & VAN DER WANT (J. P. H.). **Paper chromatography of plant viruses.**—*Proc. Acad. Sci. Amst.*, Ser. C, 57, 5, pp. 621–627, 2 figs., 1954.

This is a joint report from the Laboratory of Phytopathology and the Institute for Phytopathological Research, Wageningen, Holland, on the application of a chromatographic method to the study of tobacco mosaic virus [*R.A.M.*, 27, p. 261 and next abstract] on filter paper strips with water, using as solvents water, sodium chloride at concentrations ranging from 0·017 to 4·3 M, acetate-acetic acid buffer solutions, and an acetone-water mixture. The presence of the virus could not be identified with a spot that strongly absorbed ultra-violet rays of about 265mμ wavelength in the chromatograms, and so far its location has been detected only by the inoculation of *Nicotiana glutinosa* with extracts prepared from zones cut from the paper strips. The technique is considered, however, to afford good prospects as a simple test for the estimation of certain impurities in purified virus preparations and for use in the electron-microscopic study of low-speed centrifuged sap from diseased plants.

RAGETLI (H. W. J.), VAN DER SCHEER (CHRISTINA), & VAN DER WANT (J. P. H.). **Electronenmicroscopie van papierchromatografisch verkregen fracties van plantensappen uit virusziek en gezond material.** [Electron microscopy of fractions obtained by paper chromatography from plant saps of virus-diseased and healthy material.]—*Tijdschr. PlZiekt.*, 61, 2, pp. 35–46, 5 figs., 1955. [English summary.]

Further studies are reported involving the application of paper chromatography to the preparation for electron microscopy of the viruses of tobacco mosaic [see preceding abstract], tobacco rattle [potato stem-mottle], potato virus X, a strain of tobacco necrosis originally isolated from *Bouvardia humboldtii* [*B. longiflora*] roots, Price's yellow strain No. 6 of cucumber mosaic [*R.A.M.*, 14, p. 5], all cultured in White Burley tobacco, and tomato bushy stunt, cultured in Ailsa Craig tomato, detailed descriptions being given of the techniques employed. The typically rod-shaped particles of tobacco mosaic were remarkably uniform in length and presented close analogies with those described by Sigurgeirsson and Stanley [26, p. 267]. Similarly, the thread-like particles of potato X virus were also of equal length, but the bacilliform particles of potato stem-mottle fell into three length-groups. Electron photographs also figure preparations of tobacco necrosis, cucumber mosaic, and tomato bushy stunt viruses, and sap from a healthy plant. Superficially, the tomato bushy stunt elements resembled those described as spherical by Price *et al* [25, p. 437], but closer examination revealed a polygonal outline. Chromatograms from healthy plant sap were free from the specific inclusions associated with the viruses.

It is stated that the chromotographic technique provides a simple and valuable method for the study of virus particles by electron microscopy and obviates the difficulties associated with the aggregation of particles.

MARAMOROSCH (K.). **Relative content of Aster-yellows virus in inocula of vectors during four serial transfers.**—*Amer. J. Bot.*, 42, 7, pp. 676–678, 1955.

In order to determine the relative content of aster yellows virus [cf. *R.A.M.*, 33, p. 336] during consecutive passages of the virus through leafhoppers (*Macrosteles fascifrons*) [34, p. 54] at the Rockefeller Institute for Medical Research, New York, the insects were maintained on rye plants (immune). Inoculum was prepared from leafhoppers given four weeks' infective feeding; they were crushed, a dilution prepared, and injected into virus-free insects; these were kept for 30 days on the plants, and used in turn as virus source. The virus was thus carried to the fourth group of insects maintained on immune plants. The concentration of virus as tested on batches of Shell Pink China asters was somewhat higher at the original injection than for later injections; but the four serial transfers, without great diminution of virus titre, provided evidence for multiplication in the vector.

SMITH (K. M.). **Recent work on plant viruses.**—*N.A.A.S. quart. Rev., 1955*, 28, pp. 153–161, 4 pl., 1955.

This review [cf. *R.A.M.*, 27, p. 461], including chapters on latency of viruses, insect relationships, cure of plant virus diseases, electron microscopy, development of virus-resistant plants, multiplication of viruses, and important plant virus diseases, is taken mainly from recent literature (37 titles).

FELIX (E. L.). **Notes on some plant diseases in Tennessee.**—*Plant Dis. Reptr*, 39, 3, pp. 275–276, 2 figs., 1955. [Multilithed.]

Diseases observed in the greenhouse in Tennessee in 1954 [cf. next abstract] included strawberry powdery mildew (? *Sphaerotheca humuli*) [*R.A.M.*, 34, p. 531], which was equally pathogenic to *Fragaria viridis* and the cultivated strawberry, the Indian strawberry (*Duchesnea indica*) being apparently immune. An unusual, sharply delimited collar rot affecting tomato seedlings during the hot summer months was characterized by alternating dark brown to reddish brown and light brown bands. A species of *Rhizoctonia* resembling *R.* [*Corticium*] *solani* [29, p. 388], with small sclerotia, was consistently isolated from the lesions, but on inoculation during the winter only the usual patternless damping-off symptoms were produced. Some tomato lines showed considerable resistance to collar rot.

Plant disease survey for the twelve months ending 30th June, 1954. Twenty-fourth Annual Report N.S.W. Department of Agriculture. Biological Branch—Division of Science Services.—37 pp., 1 map, [? 1955. Mimeographed.]

Many of the important items in this report [cf. *R.A.M.*, 34, p. 283], compiled from data from the usual sources, have already been noticed in this *Review* [34, p. 706 *et passim*]. During the year sugar-cane mosaic [33, p. 210] was again the most important disease of the crop, causing a loss of about 155 tons, while red rot (*Physalospora* [*Glomerella*] *tucumanensis*) was more severe than usual, accounting for about 105, and Fiji virus [34, p. 284] for about 57 tons, out of a total loss through disease of 317 tons (0·1 per cent. of the total tonnage).

In the summer of 1953 drought and failure to spray Valencia orange trees produced conditions favourable to black spot (*Guignardia citricarpa*) [loc. cit.] in the Gosford district. Severe losses occurred in November and early December but crops on well-sprayed trees subsisted into February. Valencias picked in September from sprayed trees and exported were declared sound by German importers. Despite a dry spring, high humidities during and after flowering

sufficed for melanose (*Diaporthe citri*) [34, p. 297] to be severe in the coastal areas on older trees, particularly navel oranges and Emperor mandarins, on which dead wood had accumulated, and to cause some die-back of new growth. The severity of shell bark [on lemon: 32, p. 77] seems to depend on cultural practices, adverse growing conditions and severe pruning apparently accelerating its development. At Narara and Terrigal, Eureka lemon trees on Cleopatra stock showed earlier and more severe symptoms than trees on sweet orange and rough lemon. At Maroota, on some 18-year-old, extremely well-treated Eureka lemon trees, shell bark lesions appeared but remained small and healed rapidly with little or no chlorosis and die-back. A block of 100 six-year-old Valencia oranges on sour orange stock at Tocumwal was destroyed by the stem-pitting-tristeza virus complex [34, p. 640]. Marsh grapefruit trees 33 years old of outstanding vigour at Narromine were found to be infected with a mild strain of the stem-pitting virus. These and other selections are being tested for the protective value of this strain.

Heavy infections of pear blast (*Pseudomonas syringae*) [34, p. 284] occurred at Orange, especially on Packham's Triumph. Buds, blossoms, and spurs were blighted and lesions occurred on shoots, leaves, and fruits despite schedule spraying with Bordeaux mixture (15–15–100) plus ½ gal. white oil, followed by thiram. Blast may account for the poor setting of Packham's Triumph in Orange and other districts this season.

In the Murrumbidgee Irrigation Area, where quince orchards were unsprayed because of uneconomic returns, fleck (*Fabraea maculata*) [34, p. 304] caused considerable premature defoliation.

After heavy rains in February losses of young apricot trees from root rot (*Phytophthora cinnamomi*) occurred along the Hunter river and at Kurrajong, and many young peach trees died or were severely damaged by the same fungus in the coastal regions. The disease seems to be spread from nurseries. *P. cinnamomi* was recorded on passion fruit in several localities on the Central and North Coast and the Sydney metropolitan area; it was also reported on *Buddleia veitchiana* and caused losses of potted azaleas [*Rhododendron* spp.] in metropolitan nurseries; some new introductions appear to be very susceptible.

Antirrhinum rust (*Puccinia antirrhini*) [34, p. 285] was widely destructive.

Canker (*Monochaetia unicornis*) [34, p. 706] caused heavy losses of young cypress (*Cupressus* spp.) trees in a Bathurst nursery, and was recorded from gardens in coastal and tableland districts.

Black rot (*Xanthomonas incanae*) of stock [*Matthiola* spp. cf. 32, p. 547] was favoured in early crops by wet conditions in midsummer, and losses on metropolitan flower farms were heavy.

For two or three years rust (*Uromyces phaseoli typica*) [*U. appendiculatus*: 34, p. 764] of dwarf beans [*Phaseolus vulgaris*] has increased, especially in coastal areas, causing considerable defoliation, and more pustules developed on pods this season. Only one case of anthracnose (*Colletotrichum lindemuthianum*) [34, p. 436] was seen in seed bean crops in the south coast area.

Leaf spot (*Phoma betae*) [cf. 34, p. 347], rare in this State, was recorded on beetroot once, in the Sydney metropolitan area, damage being confined to the older leaves; there was no evidence of the more severe stages. Fodder beet was affected by bacterial blight (*Pseudomonas aptata*) [cf. 26, p. 40] at Taree, particularly after heavy frosts. It is the first record on this crop in New South Wales, though it has previously been recorded on *Tropaeolum majus*.

Root rot (*Phytophthora megasperma*) [34, p. 285] was general on cauliflower at Windsor and Castle Hill on poorly drained ground but did little damage. Other crucifer diseases reported this year included downy mildew (*Peronospora parasitica*) [cf. 31, p. 546] on cabbage at Coff's Harbour and turnip black leg (*Phoma lingam*) [cf. 34, p. 213] at Braidwood.

Downy mildew (*Pseudoperonospora cubensis*) [34, p. 285] resistance tests at Gosford Citrus Research Station showed the rock melon variety D.P.M.R. Gos. 08/1 to be resistant, and P.M.R.D_2, Hales Best×P.M.R. 45, and Hales Best moderately resistant.

EISENSTARK (A.), GOLDBERG (S. S.), & BERNSTEIN (L. B.). **Lysogenicity in Xanthomonas pruni.**—*J. gen. Microbiol.*, 12, 3, pp. 402–405, 1 pl., 1955.

An apparently lysogenic strain (H1 5L) of *Xanthomonas pruni* [*R.A.M.*, 32, p. 670], isolated in the Department of Bacteriology, Kansas State College, Manhattan, and resistant to all the *X. pruni* (Xp) phage types, was demonstrated to be so in experiments in which it was plated out on an excess of Xp4 phage and on host H1, susceptible to all the phage types that have been isolated. Phage Xp8 produced by H1 5L continued to be released after seven transfers through antiserum medium. Xp8 differed markedly from Xp4 in morphology and host range and to some extent in immunology.

DESROSIERS (R.). **Diversidad genética del Cacao como base en la selección de resistencia a la enfermedad de la escoba de bruja.** [Genetical variation in Cacao as a basis for selecting for resistance to witches' broom disease.]—*Turrialba*, 4, 3–4, pp. 131–134, 1 diag., 1954. [English summary. Received October, 1955.]

Certain forastero cacao varieties in the Amazon Valley are highly resistant to witches' broom (*Marasmius perniciosus*) [*R.A.M.*, 34, p. 354] but the high quality Nacional indigenous to Ecuador (probably a variety of forastero) possesses little resistance. Trinitario, a segregating population from natural crossing of criollo and forastero, varies widely in susceptibility. Therefore, the author recommends that breeding for resistance should be directed towards developing clones directly from forasteros, selecting from trinitarios, or hybridizing forasteros with high quality criollo and Nacional.

MACHICADO (M.) & ALVIM (P. DE T.). **Sintomatología de las deficiencias minerales de Cacao.** [Symptomatology of mineral deficiencies of Cacao.]—*Turrialba*, 4, 3–4, pp. 155–163, 14 figs., 1954. [English summary. Received October, 1955.]

The symptoms of deficiency of nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, manganese, boron, and copper, reproduced in cacao seedlings [*R.A.M.*, 33, p. 661] grown from seeds and rooted cuttings in quartz sand treated with nutrient solutions of different composition at the Inter-American Institute for Agricultural Sciences, Costa Rica, are described and illustrated.

ALVIM (P. DE T.), DUARTE (O.), CASTRO (H.), & NASCIMENTO (I.). **Mejores preparaciones hormonales para el enraizamiento de las estacas de Cacao.** [Better hormone preparations for inducing root formation in Cacao cuttings.]—*Turrialba*, 4, 3–4, pp. 147–154, 1 fig., 1954. [English summary and abstract. Received October, 1955.]

The addition of phygon XL or SR 406 (50 per cent. captan) in powder form in the ratio 1:3 to a rooting mixture consisting of 0·7 or 0·8 per cent. indolebutyric acid [*R.A.M.*, 33, p. 17] in talc significantly increased the percentage of rooting of cacao cuttings at the Inter-American Institute for Agricultural Sciences, Turrialba, Costa Rica, in experiments over the past three years. This formulation is therefore recommended.

WALLACE (H. A. H.). **Effect on its subsequent germination of sowing treated and untreated Wheat, Oat, and Barley seed in soil of sub-germination moisture content.**—Abs. in *Proc. Canad. phytopath. Soc.*, 21, p. 19, 1953.

In a series of experiments at the Plant Pathology Laboratory, Winnipeg, it was

shown that damaged wheat seed (frosted, sprouted, or fractured) sown in sub-germination moisture conditions lost its viability when the soil moisture was raised, owing to invasion by *Penicillium* spp. Untreated fractured durum wheat seed sown in dry soil retained 19·5 per cent. germination after 9 days, compared with 64 per cent. for seed treated with ceresan M [*R.A.M.*, 32, p. 122]. The figures for other treatments were: ½-oz. leytosan, 55; four-hour soak in cool water, 54; formaldehyde, 37; hot-water treatment, 26. When sown in moist soil untreated seed and that treated with ceresan M, ½-oz leytosan, or cool water gave 95 per cent. germination, the comparable figures for formaldehyde- and hot water-treated seed being 90·5 and 56·5 respectively. The germination of elite Thatcher wheat seed sown in dry soil was increased by treatment by 12·5 per cent., Victory oats by 5·4 per cent., and Montcalm barley by 9 per cent., whereas in moist soil the effect on the germination of cereals was negligible.

Heermann (R. M.). **Inheritance of stem rust reaction in Durum and Emmer crosses with particular reference to race 15 B.**—*Diss. Abstr.*, 15, 3, pp. 312–313, 1955.

As only a few varieties and selections of durum and emmer wheats were known to be resistant to race 15 B of stem rust [*Puccinia graminis*: *R.A.M.*, 34, p. 289] at the end of the 1950 season, the inheritance of rust reaction in the seedling and adult stages was studied at the University of Minnesota in 14 crosses involving Khapli emmer, three selections from Khapli × durum crosses, Stewart, C.I. 3255, P.I. 94701, and R.L. 1714.

The seedling resistance in Khapli emmer was controlled by the dominant factors A and B, A alone producing a type X reaction, B alone type 2, and both together the highly resistant reaction of Khapli. The A and B factors for adult resistance were identical with or closely related to those for seedling resistance. The seedling and adult reactions of C.I. 3255, P.I. 94701, and R.L. 1714 proved to be monofactorial in crosses with Stewart, the factors being allelic. Factor E^1 from C.I. 3255 and P.I. 94701 was partially dominant and e from R.L. 1714 nearly recessive. A and B from Khapli and the E alleles from the durum varieties were inherited independently. Adult resistance from Khapli emmer was controlled by four independent factors. The Khapli genotype was AABBccdd. Dominant C from Stewart was partially epistatic to A and B. D had an additive effect for susceptibility with A, was partially epistatic to A, and did not modify the expression of B.

Le Tourneau (D. J.). **Catalase activity and chlorophyll content of several species of Triticum in relation to their resistance to Puccinia graminis tritici.**—*Diss. Abstr.*, 15, 3, pp. 322–323, 1955.

In a study at the University of Minnesota to determine some of the host factors responsible for physiologic resistance of wheat to stem rust (*Puccinia graminis*) it was found that catalase activity increased in rust-infected leaves of a susceptible variety as compared with non-infected leaves once spore production was initiated, while in a resistant variety the earlier marked increase dropped to the level of that in non-infected leaves as the rust failed to develop. The uredospores had a high catalase activity. There was no consistent difference in the chlorophyll content of infected and non-infected leaves during the early stages of infection but it decreased as the leaves became flecked by rust.

Wallen (V. R.). **Control of stem rust of Wheat with antibiotics. I. Greenhouse and field tests.**—*Plant Dis. Reptr.* 39, 2, pp. 124–127, 1955. [Multilithed.]

In greenhouse trials carried out by the Canadian Department of Agriculture, Ottawa, using Little Club wheat inoculated with race 15 B of wheat stem rust (*Puccinia graminis* var. *tritici*) [*R.A.M.*, 33, p. 341] actidione proved to be the best of six antibiotics used as sprays 48 hours before or after inoculation. In field trials

with Garnet spring wheat inoculated with a mixture of races actidione was applied at 25, 50, 100, 200, and 500 p.p.m. Over 50 p.p.m. caused some leaf injury, but recovery generally ensued. Spraying every ten days at 500 p.p.m. reduced infection from 100 per cent. to 0 to 5 per cent.

PLESSERS (A. G.). **The genetics of stem and leaf rust reactions and other characters in crosses of Lee Wheat with Chinese monosomic testers.**—*Diss. Abstr.*, 15, 3, p. 323, 1955.

At the University of Minnesota Lee wheat [*R.A.M.*, 34, pp. 287, 288], selected from Hope × Timstein, was crossed with both normal Chinese spring wheat and each of the 21 monosomic testers to determine the number of genes responsible for its resistance to races of leaf and stem rust [*Puccinia triticina* and *P. graminis*] and to associate these genes with their respective chromosomes.

Resistance to *P. triticina* was partially dominant for races 5, 35, and 16, partially recessive for 15 and 9, and wholly so for 126, and in all was governed by more than one factor. It is postulated that these segregations are governed by three interacting genes, the interaction probably differing according to the race. Segregation in the F_2 hybrids monosomic for chromosome V differed consistently from the normal segregation, possibly because one gene for resistance is located on chromosome V of Lee. There were also indications that genes or modifiers for resistance to races 5 and 15 of *P. triticina* are carried on chromosome II of Lee or Chinese, to race 9 on IV of Lee, and to race 126 on XIV of Lee.

The resistance of Lee to races 11, 15, 19, and 49 of *P. graminis* is controlled by two dominant factors in coupling, both located on chromosome X.

DA SILVA (A. R.). **Breeding for stem and leaf rust resistance in Wheat in Brazil; including basic genetical studies and a survey of the physiological races of rust.** —*Diss. Abstr.*, 15, 3, p. 322, 1955.

The author presents the results of a programme of wheat breeding for resistance to stem and leaf rust [*Puccinia graminis* and *P. triticina*] in Brazil [*R.A.M.*, 28, p. 12; 33, p. 595] from 1950 to 1953 and of a survey of the physiologic races present. The most prevalent race of *P. graminis* was 17, accounting for 81·7 per cent. infection, followed by 15 (15·8), and 11 (2·5). Races 2, 6, 12, 13, 20, 21, 31, 49, 57, 61, 62, 64, 77, 85, 108, 114, 117, 130, and 143 to 150 of *P. triticina* were identified, of which 20, 77, and 31 were the most prevalent and 144 to 150 newly reported. The main Brazilian wheat varieties were in general susceptible to *P. graminis*. Of several hundred other varieties and lines tested with races 11, 15, 17, and 42, 24 were resistant to all four. Field resistance was generally derived from Kenya wheats. Tested against *P. triticina*, Frontana, Rio Negro, and Trapeano showed the highest field resistance and these and Centeiroz and Bage were resistant in the seedling stage to several individual races.

In a number of cases the stem rust resistance of selections from crosses involving Kenya 58, Red Egyptian, (III[1] × Chinese) Timopheevi, and Egyptian NA 101 was conditioned by one or two factors. The inheritance of resistance to leaf rust races 31 and 77 in crosses involving the varieties Bage, Frontana, and Rio Negro was conditioned by up to three factors.

According to these results, breeding for rust resistance was based on the use of Kenya 58, Red Egyptian, and Timstein as sources of resistance to stem rust and Frontana, Fronteira, and Rio Negro as varieties possessing some resistance to leaf rust and being well adapted to Brazil. This programme has yielded several lines outstanding for stem rust resistance, equal to Frontana and Rio Negro in leaf rust resistance, and resembling Frontana in yield and other agronomic characters. One Frontana × Kenya 58 selection is to be released in São Paulo. To improve resistance to leaf rust crosses were made in 1950 between stem rust resistant lines and several

varieties including Sincalocho. Stem rust resistance was improved in 1951 and 1952 by crossing resistant lines with new Brazilian varieties that outyield Frontana.

VALLEGA (J.). **Wheat rust races in South America.**—*Phytopathology*, 45, 5, pp. 242–246, 1 fig., 1 diag., 1955.

Reference has already been made in this *Review* to most of the 31 studies on physiologic specialization in wheat rusts (*Puccinia* spp.) in South America [cf. preceding abstract] on which the author bases his survey of the subject presented at the Symposium on Co-operative Agricultural Research in the Western Hemisphere at Madison, Wisconsin, on 9th September, 1953.

THORPE (H. C.). **Release of new cereal varieties. V.**—*E. Afr. agric. J.*, 20, 2, pp. 133–134, 1954.

The following new wheat varieties were released to farmers by the Department of Agriculture, Kenya, for sowing in the 1953–4 season [cf. *R.A.M.*, 33, pp. 77, 416]. D.C. × Ceres R. 64, selected from the hard red Canadian spring wheat D.C. × Ceres, is resistant to the 12 physiologic forms of stem rust (*Puccinia graminis tritici*) known in Kenya, but was slightly attacked by an unknown and possibly new form.

Carleton C.I. 12064, introduced from the United States, has proved susceptible to races K9 and K12 of stem rust and its future appears doubtful.

Releases for the 1954–5 season include wheat No. 351, A.S.I.B.2, from the cross 117.A × Regent 975.6, which was resistant in seedling tests to all 12 races, but was slightly attacked in the field by K9 and K12. It showed resistance to yellow rust (*P. glumarum*) up to 8,500 ft.

GRIFFITH (R. B.), ZSCHEILE (F. P.), & OSWALD (J. W.). **The influence of certain environmental factors on expression of resistance to bunt in Wheat.**—*Phytopathology*, 45, 8, pp. 428–434, 3 figs., 1955.

At the Departments of Plant Pathology and Agronomy, University of California, Davis, post-emergence environment exerted a strong influence on the expression of resistance to *Tilletia caries* in wheat [cf. *R.A.M.*, 4, p. 339; 10, p. 302; 11, p. 795; 19, p. 524; 22, p. 295, *et passim*]. Thus, only 21 per cent. of the susceptible Baart plants and none of the resistant Baart 38, although extensively invaded by bunt mycelium when transplanted to the field in May, were diseased at maturity. On the other hand, all the Baart plants grown to maturity in the laboratory, with a 20-hour period of illumination from fluorescent lights, produced bunted heads in repeated experiments. No bunt balls were found on any of the Baart 38 plants grown under these conditions, but microscopic examination revealed chlamydospores within externally normal seeds. Of the seed-inoculated Baart plants grown to maturity at 10° to 13° C., with 20 hours' illumination from incandescent bulbs, 90 per cent. contracted the disease, while 58 per cent. of Baart 38 developed symptoms of bunt in the adult stage.

Variations were observed in the growth of inoculated plants of both varieties in the several artificial environments, but not in those grown in the field. For instance, in the warm room with fluorescent light both Baart and Baart 38 plants were stunted in the early stages; at maturity the former remained shorter than the uninoculated controls, whereas the latter were equal in height. In the cold room illuminated by incandescent light, the inoculated Baart plants were the same height as the controls in the initial phases of growth but shorter at maturity, while those of Baart 38 developed and matured more slowly and were shorter in the adult stage than the uninoculated.

Resistance in Baart 38 was shown to be associated with an inhibition of chlamydospore development rather than of vegetative growth of the fungus within the host.

Bayles (R. J.). **Field infection experiments with dwarf bunt of winter Wheat in Ontario.**—*Plant Dis. Reptr.* 39. 2. pp. 159–160. 1955. [Multilithed.]

Experiments at the Division of Botany and Plant Pathology, Ottawa, on the infection of wheat by *Tilletia brevifaciens* [*T. controversa*: *R.A.M.*, 33, p. 531] in naturally infested soil and with the addition of spores at seeding indicated that weather and soil moisture conditions from the time of seeding are more important factors in deciding the amount of infection than seeding dates. Seed treatments were ineffective against spores in the soil.

Sallans (B. J.). **Depth of crown formation in Wheat in relation to root diseases.**—Abs. in *Proc. Canad. phytopath. Soc.*, 21, p. 18, 1953.

At the Plant Pathology Laboratory, Saskatoon, Saskatchewan, deep crown formation in wheat, favoured by low soil temperatures, was found to decrease the infectivity of *Helminthosporium sativum* [*R.A.M.*, 33, p. 474 and next abstract] and *Fusarium culmorum* [33, p. 139]. Low light intensity causes shallow crown development and renders the plant more susceptible to these root-rot fungi.

Campbell (W. P.). **The influence of some associated microorganisms on the pathogenicity of Helminthosporium sativum P., K., & B.**—Abs. in *Proc. Canad. phytopath. Soc.*, 21, p. 12, 1953.

At the Plant Pathology Laboratory, Edmonton, Alberta, *Trichoderma viride*, *Phoma humicola*, and *Epicoccum purpurascens* [cf. *R.A.M.*, 31, p. 634] were found to limit the pathogenicity of *Helminthosporium sativum* [see preceding abstract] in natural or sterilized soil, the depressing effect increasing with a temperature rise from 10° to 26° C. *E. purpurascens* and *Myrothecium verrucaria* were found as internal parasites in *H. sativum* spores, and in culture they produced a substance which severely inhibited the germination and germ-tube growth of *H. sativum*.

Schenk (R. C.) & Kennedy (W. K.). **Laboratory evaluation of fungicides for the preservation of moist grain.**—*Agron. J.*, 47, 3, pp. 128–130, 1 diag., 2 graphs, 1955.

In the Agronomy Department, Cornell University Agricultural Experiment Station, Ithaca, New York, 100 gm. wheat grain samples containing 29 per cent. moisture were treated with 0·125, 0·25, or 0·5 per cent. 2, 4, 6-trichlorophenol, 0·1 or 1 per cent. thiourea, 0·05 or 0·1 per cent. 1-chloro-2-butanone, or 0·8 per cent. ethanol and placed in 250-ml. Erlenmeyer flasks at a constant temperature of 25° C. Approximately 10 l. carbon dioxide-free air were passed through each flask daily and the samples examined weekly for visible mould growth [unspecified: *R.A.M.*, 34, p. 567]. The final wet weight and total loss of dry matter were determined at the end of the storage period, 79 days.

Untreated and ethanol-treated wheat moulded in four days and had the highest rate of carbon dioxide evolution and the highest dry matter loss. Thiourea delayed mould growth for only three or four days but lowered the respiration rate as compared with untreated grain; 1-chloro-2-butanone delayed mould growth for about a month and reduced carbon dioxide evolution effectively during the first 23 days of storage. At the 0·25 and 0·5 per cent. rates 2, 4, 6-trichlorophenol prevented mould growth for the entire storage period, the dry matter loss was less than 5 per cent., and at no time did the respiration rate exceed 100 mgm. carbon dioxide per day, but the toxicological problems associated with the use of these chemicals need further consideration.

ZEIDAN (M. I.). **The inheritance of resistance to Ustilago nuda Jens. K. and S. race 1, in Barley.**—*Diss. Abstr.*, 15, 3, p. 326, 1955.

In studies at Michigan State College on the inheritance of resistance to loose smut (*Ustilago nuda*) race 1 in barley [*R.A.M.*, 34, p. 590] the non-commercial varieties Jet, Anoidium, Harlan, and Ogalitsu were crossed in all possible combinations, and the florets of one or two heads of F_2 plants needle-inoculated with drops of a spore suspension.

The inheritance of resistance in the crosses Jet × Harlan, Harlan × Ogalitsu, and Ogalitsu × Anoidium was governed by two gene pairs acting in duplicate dominant epistatic condition, the genes being different and inherited independently and each parent possessing one dominant gene pair for resistance. In Harlan × Anoidium there were two gene pairs exhibiting dominant and recessive epistasis, these genes also being different and independently inherited, and each parent possessing one dominant gene. There was no evidence of linkage between resistance and morphological characters.

JÁNOSSY (A.). **Our improved cereal varieties.**—*Mag. Mezőg., 1954*, 18, p. 5, 1954. [Abs. in *Hung. agric. Rev.*, 3, 4, p. 3, 1954.]

Of the improved winter barley varieties cultivated in Hungary, Béta of Lédec shows least susceptibility to loose smut [*Ustilago nuda*]. No. 68 of Mezőhegyes is a similar barley but rather more susceptible.

SIMONS (M. D.). **The use of pathological techniques to distinguish genetically different sources of resistance to crown rust of Oats.**—*Phytopathology*, 45, 8, pp. 410–413, 1955.

Using techniques of inoculation, isolation, increase of physiologic races, and notation of reaction type modelled on those of Murphy [*R.A.M.*, 14, p. 435] and Finkner *et al.* [33, p. 475], the author investigated the responses of 13 varieties and strains of oats to races 202, 203, 205, 216, 258, and 263 of *Puccinia coronata* under different environmental conditions at the Iowa Agricultural Experiment Station [34, pp. 222, 713, and next abstract].

The resistance to race 202 of seedlings of Landhafer and P[lant] I[ntroduction] Nos. 185663, 185785, and 198227, grown in sand culture supplied with a high-nitrogen nutrient solution and maintained at a temperature of 85° F., was broken down sufficiently to distinguish these selections as a separate group. The reactions of the test material to the above-mentioned six races indicated that the genes involved in the resistance of Silva Selection and P.I. Nos. 186603 and 189624 differ from those of the other varieties and strains, probably representing a higher degree of resistance. P.I. 186610, resembling Victoria in many respects, appears to be resistant to some of the common races which attack the latter. Certain races, e.g., 216, were more effective than others (notably 205) in the inducement of susceptible reactions in detached leaves.

At a concentration of 0·35 per cent., maleic hydrazide 30 entirely suppressed crown rust development on all the varieties and strains used in this study except Victoria and P.I. 186610, in which it induced susceptibility. On the other hand, DDT [cf. 25, p. 336] exerted little or no effect on the reactions of any of the varieties and strains to five of the races (excluding 263).

The six varieties and lines resistant to race 263, i.e., Victoria, Silva Selection, and P.I. Nos. 174513, 186603, 186610, and 189624, were susceptible to *Helminthosporium victoriae* [28, p. 390]. Conversely, the other eight were resistant to Victoria blight but susceptible to crown rust race 263.

SIMONS (M. D.). **An extensive type of necrotic host reaction of Oats to crown rust.**—*Phytopathology*, 45, 8, pp. 462–463, 1 fig., 1955.

While identifying at the Iowa Agricultural Experiment Station collections of

crown rust of oats (*Puccinia coronata*) [see preceding abstract] made in 1951, it was noted that some leaves of the differential Bond variety were either dead or contained large, irregular areas of necrotic tissue. Uredosori were often present in the living and occasionally in the dead portions. A similar phenomenon in the old differential variety Sunrise had previously been attributed to exceptional susceptibility to high-temperature injury or other unfavourable conditions in the humidity chamber, but this view could not be maintained in the case of Bond which reacted thus under optimum conditions. No evidence was obtained for the association of the necrosis with infection by other common pathogens of oats, e.g., *Septoria avenae* or bacteria, and it is concluded, therefore, that *P. coronata* was responsible.

The variable reaction type on a single leaf of Bond, ranging from fully susceptible with 4-type uredosori to the above-mentioned shrivelled areas with no uredosori, appears to be an inherent characteristic of this particular host-parasite interaction. Observations on crown rust collections made in 1952 and 1953 indicated that cultures inducing extensive necrosis in Bond usually evoked a susceptible or moderately susceptible response in Victoria. Using relative spore production as the criterion of reaction type, Bond was classified as 'resistant' to these cultures, most of which were assigned to physiologic race 258.

Koo (F. K. S.), Moore (M. B.), Myers (W. M.), & Roberts (B. J.). **Inheritance of seedling reaction to races 7 and 8 of Puccinia graminis avenae Eriks. and Henn. at high temperature in three Oat crosses.**—*Agron. J.*, 47, 3, pp. 122–124, 1955.

During 1953, F_3 lines of oats derived from crosses between a hybrid (LMHJA) and Andrew, Clinton, and Gopher were examined at the University of Minnesota for inheritance of seedling reaction to inoculation with races 7 and 8 of stem rust (*Puccinia graminis avenae*) [*R.A.M.*, 32, p. 371] at 85° F. This investigation was intended to throw further light on the inheritance of the 'Canadian', White Russian, and Richland types of stem rust resistance and the hypothesis of allelism of the factors for the two last-named. After 12 to 14 days the infection types were classified. Andrew, Bonda, Hajira-Joanette, and Victoria-Hajira-Banner being used as the checks in each test.

The results indicated that the hybrid parent was resistant to both races, Andrew resistant to race 7 but susceptible to 8, Clinton resistant to 8 but susceptible to 7, and Gopher susceptible to both. LMHJA carries two closely linked factors, one for resistance to each race, which are the same or similar to the resistance genes in the other varieties.

The combination of the White Russian and Rainbow (Richland type) genes for rust resistance in the LMHJA lines may have resulted from crossing over. Whatever its origin these genes can now be combined in new varieties as readily as if they were a single gene, together conditioning resistance at all temperatures to all known races of *P. graminis* except 4, 6, and 13. Combined with the 'Canadian factor' in the same variety they provide a relatively high degree of protection against all the races now known to occur. Experimental varieties carrying this resistance plus the Landhafer gene for resistance to crown rust [*P. coronata*: see preceding abstract] are undergoing preliminary tests in Minnesota.

Luke (H. H.) & Wheeler (H. E.). **Toxin production by Helminthosporium victoriae.**—*Phytopathology*, 45, 8, pp. 453–458, 2 figs., 4 graphs, 1955.

Previous reports that cultures of *Helminthosporium victoriae* produce a toxin inducing the same symptoms on oats as the fungus itself and exhibiting an identical host specificity [*R.A.M.*, 27, p. 16; 28, p. 390] were substantiated by studies at the Department of Botany, Bacteriology, and Plant Pathology, Louisiana State University.

A chemically defined medium conducive to toxin production was used and a

method of quantitative bioassay was developed, based on retardation of root growth. Culture filtrates, which at a dilution of 1 in 1,200,000 reduced root growth in seedlings of the susceptible Fulgrain, Victorgrain, Victorgrain 48–93, Victoria, and Arlington varieties by 50 per cent., exerted no effect at 1 in 10 on the resistant Nortex, New Nortex, Fergerson, and Camellia, on other cereals, or on a number of garden vegetables.

Five mutant cultures were obtained from a monospore isolate of *H. victoriae*, three of which were pathogenic in varying degrees to Victorgrain 48–93 while two were innocuous. Among the pathogenic cultures differences in virulence were correlated with disparities in toxin production, which in turn were directly connected with the growth rates. On the other hand, the virtual absence of toxin production by the two non-pathogenic isolates could not be attributed to arrested development, since the growth rate of one was intermediate between that of the first and second in order of virulence, while that of the other was only slightly slower than the least pathogenic. The results of tests on culture filtrates adjusted to various pH levels denoted that the toxic agent was quite stable at pH values below 4 but unstable at higher ones and was rapidly destroyed by heat in neutral or alkaline filtrates.

It is concluded from the high activity of the toxin, its specificity, and the association of its production with pathogenicity and growth in pure culture that this substance is primarily, if not wholly, responsible for the major symptoms of Victoria blight. The experimental observations also point strongly to the existence in the filtrates of a second much less active, non-specific factor which may be concerned in the causation of such minor features of the disease as leaf flecking on resistant plants [cf. 32, p. 546].

Graniti (A.). **Note fitopatologiche. I. Un ospite di Claviceps purpurea (Fr.) Tul. nuovo per l'Italia: Avena sativa L. (cult.).** [Phytopathological notes. I. A host of *Claviceps purpurea* (Fr.) Tul. new for Italy: *Avena sativa* L. (cult.).]—*Notiz. Malatt. Piante, 1955*, 29 (N.S. 8), pp. 16–18, 1955. [English summary.]

In the summer of 1951 sclerotia of *Claviceps purpurea* on oats [cf. *R.A.M.*, 3, p. 207; 24, p. 177] were received from Santulussurgiu, Nuoro, Sardinia. Diseased oats were also present in other localities up to 10 km. away, while barley too was affected. This is the first report of the fungus on oats in this area; the disease was again present in 1952 and 1953, though less prevalent.

Saccas (A. M.). **La rouille américaine du Mais (Zea mays L.) due à Puccinia polysora Underw. au Cameroun et en Afrique Équatoriale Française.** [The American rust of Maize (*Zea mays* L.) caused by *Puccinia polysora* Underw. in the Cameroons and French Equatorial Africa.]—*Agron. trop., Nogent*, 10, 4, pp. 499–522, 12 figs., 2 graphs, 1955. [English and Spanish summaries.]

One-month-old plants of the maize varieties Yangambi 120 jours, Jaune des Landes, and Blanc nain were sprayed with a suspension of uredospores of *Puccinia polysora* at the Bukoko Station, French Equatorial Africa [*R.A.M.*, 33, p. 150 and cf. next abstract]. Three hours later about 30 per cent. had germinated and the germ tubes of 5 to 10 per cent., all in the vicinity of stomata, had reached the pore and formed appressoria. After 12 hours 20 to 30 per cent. had sent hyphae into the stomata and after four days the whole depth of the leaf was invaded, the hyphae forming up to seven haustoria per cell. Stromata were formed beneath the stomata; after 12 days the tissue surrounding the latter appeared as circular, yellow spots. Uredosori formed 15 to 20 days after infection and erupted five days later. The mycelium remained intercellular and only cells in immediate contact with the sori were killed. Hyphae penetrated the parenchyma and progressed rapidly; they were rarely found in the vessels of the leaves. Cells of susceptible

varieties died slowly and those of resistant ones quickly, the necrotic tissue presenting a barrier to the further progress of the fungus.

Some resistance was shown by the American varieties Capetown and Cuba Amarillo [34, p. 632] in the Lower Dahomey, by Tsolo in Nigeria and the Gold Coast, and by Yangambi 120 jours in the Bukoko experiments.

The assessment of the damage caused by *P. polysora* is rendered difficult by a long-standing confusion with *P. sorghi*. In the regions of N'Tem, Dja, Lobo, and Sanaga in the Cameroons damage in 1952 was estimated at 50 to 95 per cent. In French Equatorial Africa [C.M.I. map No. 237] the harvests were almost destroyed; in Lobaye, Ubangui, and the districts of Mobaye and Waka Kotto in the Haute-Sangha losses were 70 to 80 per cent.; the M'Bomu area was equally affected. In the French Congo damage to the variety Yangambi 120 jours was slight at the Ludima Station, but at Ewo, Likuala-Mossaka, it was severe. Figures are not available for Woleu-N'Tem in Gabon or for Tchad, which are known to be affected.

Early sowings are less liable to losses. Maize grown in forest soils, which are rich in humus, gives good crops despite the presence of the fungus, but humidity seems to favour the disease.

Ryland (A. K.) & Storey (H. H.). **Physiological races of Puccinia polysora Underw.**—*Nature, Lond.*, 176, 4483, pp. 655–656, 1955.

In studies at the East African Agriculture and Forestry Research Organization, Mugaga, Kenya, the variable hypersensitive reaction to *Puccinia polysora* [*R.A.M.*, 34, p. 716 and cf. preceding abstract] displayed by resistant maize seedlings was classified as 01 for necrotic lesions without sorus development and 1 for necrotic lesions with well-developed small sori, the fully susceptible reaction, with large sori and very little surrounding chlorosis, being classed as 4. The reactions of uredospores from Zanzibar, Northern Tanganyika, and Uganda maintained in separate greenhouses remained stable for nearly two years through 1,600 family tests, these results being supported by tests on maize lines in the field during 1953 and 1954. However, in January, 1955, routine tests of certain resistant lines resulted in the development of a few large sori characteristic of full susceptibility, indicating the presence of a new race of *P. polysora*. In inoculation experiments selfs of AFRO 29, second selfs from AFRO 29 × durum, and a self of AFRO 250, previously reacting with 01 lesions, all gave a class 4 susceptible juvenile reaction to the new race which it is concluded must have appeared in the glasshouses, particularly as the nearest known field infection was over 100 miles away.

Rowell (J. B.). **Functional role of compatibility factors and an in vitro test for sexual compatibility with haploid lines of Ustilago zeae.**—*Phytopathology*, 45, 7, pp. 370–374, 1 fig., 1955.

In further studies at the Department of Plant Pathology, University of Minnesota, functional roles of the compatibility factors for sex in haploid lines of *Ustilago zeae* [*U. maydis*: *R.A.M.*, 34, p. 293] were identified by observations on the behaviour of individual sporidia paired by micromanipulation on drops of dilute maize coleoptile extract agar. Sporidial fusions occurred in compatible combinations within three to four hours of mating, and after a further similar period a distinct hypha was produced. The reisolation of both parental lines from single hyphal tip cultures demonstrated the dicaryotic nature of such hyphae.

The tetrapolar sex groups of *U. maydis* established by maize inoculation experiments were postulated to result from two factor pairs, one with two (a^1 and a^2) and the other with multiple alleles (b^1, b^2, b^3, ... , b^n). Fusions were observed between mated sporidia of all a^1 and a^2 lines, but not between those of lines with similar *a* alleles, and it is concluded, therefore, that the *a* factors govern sporidial fusion. Infection hyphae developing from fused sporidia with different *b* alleles, e.g.,

$a^1b^2 \times a^2b^3$, were straight, making rapid growth with sparse branching, and only produced aerial haploid conidia after some 24 hours' development. On the other hand, fused sporidia with similar *b* alleles, such as $a^1b^2 \times a^2b^2$, grew slowly, branched profusely and produced aerial haploid conidia within 12 hours. Evidently, therefore, the *b* alleles control the vigour and stability of the dicaryon and presumably also the compatibility of the paired nuclei.

The observations on the vigour of hyphae from paired sporidia were confirmed by matings of sporidial mixtures on the above-mentioned medium. The production of infection hyphae by compatible lines under these conditions was a useful, rapid test for identification of the compatibility factors among 669 monosporidial isolates from 168 sori collected in the field. However, few or no such hyphae were produced by biochemical mutants and other lines after lengthy periods of culture on agar media. It appeared from these results that infection of inoculated maize seedlings was a more reliable index of sexual compatibility between haploid lines of *U. maydis* than the production of infection hyphae on maize coleoptile extract agar.

Calavan (E. C.) & Weathers (L. G.). **Relationship of fungi to shell bark of Lemons.** —*Calif. Citrogr.*, 39, 5, pp. 154, 156, 158, 1 fig., 1954. [Received 1955.]

The information in this article on shell bark of lemons in California has already been noticed from another source [*R.A.M.*, 34, p. 718].

Rodney (D. R.) & Boswell (S. B.). **Sodium in Lemon tree collapse.**—*Calif. Agric.*, 8, 9, pp. 14–15, 2 graphs, 1954.

This information from the University of California Citrus Experiment Station, Riverside, has already been noticed from another source [*R.A.M.*, 34, p. 640].

Roistacher (C. N.), Eaks (I. L.), & Klotz (L. J.). **Ammonia gas to control blue-green mold decay of Citrus fruits.**— *Plant Dis. Reptr.* 39, 3, pp. 202–205, 1 fig., 1955. [Multilithed.]

At the University of California Citrus Experiment Station, Riverside, ammonia was tested for the control of *Penicillium italicum* and *P. digitatum* [*R.A.M.*, 34, p. 641] on oranges and lemons during colouring operations, when the fruits are particularly susceptible to decay. Introduced twice daily for three or more consecutive days, with or without ethylene, into various containers, including miniature colouring rooms, ammonia at 2,500 or 5,000 p.p.m. (to total volume of the container) gave excellent protection of wounded, inoculated fruits without causing injury or affecting the flavour. A small percentage of the spores on treated fruits was still viable seven days after inoculation but they failed to initiate infection during the subsequent two-week holding period.

First Annual Report of the West African Institute for Oil Palm Research, 1952–1953. —135 pp., 1 col. diag., 1953.

The plant pathology section (pp. 108–125) of this report contains descriptions of the most important diseases and nutritional disorders of oil palm in Nigeria, which have been noticed in greater detail from another source [*R.A.M.*, 34, p. 719]. It also contains an account of a disease of coco-nuts in Onitsha province with symptoms similar to those of bronze leaf wilt in the West Indies [cf. *Commonw. Phytopath. News*, 1, p. 14, 1955].

Gutierrez (Lucy H. de). **Muerte descendente causada por Colletotrichum en las plantas de Café en el almácigo y su combate por medio de aspersiones en Turrialba, Costa Rica.** [Die-back caused by *Colletotrichum* in Coffee plants in the nursery and its control by means of sprays in Turrialba, Costa Rica.] — *Turrialba*, 4, 3–4, pp. 115–124, 3 figs., 1954. [English summary. Received October, 1955.]

Leaf-spotting, defoliation, and die-back of the terminal and lateral branches of

nursery coffee seedlings at Turrialba, Costa Rica, caused by *Glomerella cingulata* [*R.A.M.*, 31, p. 374: 33, p. 712] was more severe in seedlings fully exposed to the sun than in those with 50 per cent. shade and at very high humidities; young leaves were more susceptible than old.

Studies on the disease and its control were made at the Inter-American Institute for Agricultural Sciences, Turrialba, from 1947 to 1951. The results of an experiment in May, 1950, demonstrated the superiority of weekly applications of fermate (2 in 100) over Bordeaux mixture (5–5–50), for which the rate was later reduced to 2–2–50 owing to copper injury. The average number of dead branches in the partially shaded plots was 6·7 (Bordeaux), 4 (fermate), and 11·3 (untreated) and 49·7, 20·7, and 35·7 in full sunlight, while the corresponding figures for the average number of infected leaves were 54·3, 25, and 49·3, and 70·3, 20, and 90, respectively. In December, 1950, six fungicides applied weekly or bi-weekly at 2–100 were compared in an unshaded nursery. Only fermate (at both intervals) reduced leaf infection significantly and also the number of dead branches. Weekly applications were consistently better than bi-weekly though the difference was not significant. The untreated plants lost 61·1 per cent. of the branches produced during the year and retained only 8·3 per cent. of the leaves while those treated with fermate weekly lost 7·3 per cent., bi-weekly 13·8, and retained 74 and 65·7 per cent. of their leaves, respectively. Weekly copper sprays caused considerable injury and parzate increased infection.

Koba (S.). **Patho-physiologic studies on the damping-off of cultivated plants. Relation between the age of the Cotton seedling and the Fusarium root rot.**—*Ann. phytopath. Soc. Japan*, 18, 1–2, pp. 1–4, 1 fig., 1953. [Japanese, with English summary. Received 1955.]

Cotton seedlings [? at Kyushu University, Japan] proved very susceptible to damping-off (*Fusarium* spp.) [*R.A.M.*, 30, p. 318] at the eight- to 15-day-old stage, when stored food is exhausted and photosynthesis low. Infection increased respiration and decreased transpiration in the seedlings.

Stewart (R. B.) & Whitehead (M. D.). **Nub-root—the expression of seedling disease in the mature Cotton and Flax plant.**—*Phytopathology*, 45, 8, pp. 413–416, 2 figs., 1955.

Investigations are reported from the Texas Agricultural Experiment Station to test the hypothesis that 'nub root', an apparently undescribed expression of seedling disease of cotton [*R.A.M.*, 34, p. 149], flax, and possibly other tap-rooted plants, is incited by fungi. Of 75 cotton seedlings with root lesions transplanted to sterile soil, 46 per cent. developed nub-root symptoms (hitherto attributed to unfavourable soil structure), as compared with only 4 per cent. of those free from macroscopic lesions. *Fusarium* spp., *Pythium* spp., and *Corticium solani*, of which the first-named cause the heaviest damage in central Texas, were isolated on potato dextrose agar from the diseased tissues.

When the mycelium does not penetrate beyond the endodermal layer, the host may recover completely, whereas death ensues from damping-off following the ramification of the fungi through the cortical tissue and stele. Nub root represents a situation intermediate between these two extremes. Severely affected tap-roots appear to have been cut off near soil-level. When the normal tap-root system is destroyed, lateral roots may develop and permit the plant to reach maturity, but they also tend to be invaded by fungi. Uni- or bilateral infection (without complete girdling) results in the formation of an extended, flattened, blade-like root. Aerial wilting varies in intensity with the severity of root infection and may, in fact, be entirely absent where the underground symptoms are only moderate. Roots of

nursery flax were similarly affected, the abnormality in this case being accompanied by foliar chlorosis and reddening.

Nub root was present throughout the cotton-growing sections of Texas from 1952 to 1954, inclusive, and in conjunction with other seedling diseases caused yield losses in the last year ranging from 5 to 75 per cent. In 1954 the disease was also observed in Oklahoma.

VATOLKINA (Mme K.). Эффективность препаратов НИУИФ в борьб с гоммозом Хлопчатника. [Effectiveness of the NIUIF preparations in the control of Cotton gummosis.]—Хлопководство [*Cotton Raising*], 5, 9, pp. 37–39, 1955.

Experiments were carried out by the Scientific Research Institute of Cotton Cultivation in the new [cotton] areas of the U.S.S.R. for the control of cotton gummosis [blackarm: *Xanthomonas malvacearum*: *R.A.M.*, 34, p. 523]. Of the NIUIF preparations tested, granosan (10 kg. per t[on] of seed), mercuran (10 and 8 kg.), and a formalin solution (1:90) were the most effective when the seed was sown dry, resulting in 0, 0, 0·9, and 0·08 per cent. seedling infection as against 44·8 per cent. for the untreated, while 20 and 15 per cent. copper trichlorophenolate (8 kg.), the lower rate given a subsequent moistening, and mercuran (10 kg.) gave lowest infection percentages (0, 0·4, and 0 as against 13·9 for hexachlorophenol). Mercuran caused severe seedling deformity and is not recommended for wet seed.

Recommendations are that mercuran and granosan, both at 10 kg., should be used for dry fuzzy seed and at 4·5 kg. for mechanically delinted; 20 per cent. copper trichlorophenolate (7 to 8 kg.) is best for moistened fuzzy seed. In one experiment granosan and mercuran at 5 kg. reduced infection in seedlings from mechanically delinted seed from 8·6 (untreated) to 0·9 and 0·6 per cent., respectively.

DUDDINGTON (C. L.). **Notes on the technique of handling predacious fungi.**—*Trans. Brit. mycol. Soc.*, 38, 2, pp. 97–103, 1955.

Primary cultures of predacious fungi are obtained by plating out about 2 gm. of rotting vegetable matter at room temperature. Maize meal agar (2–2–100) is an ideal medium for preventing heavy growth of other moulds. A weak rabbit dung agar is well suited to the study of internal parasites of nematodes, while an adaptation of the Warcup soil plate technique [*R.A.M.*, 29, p. 530] can be used for soil predators.

For subcultures it is best to ensure that some of the host animals are included or already present. A culture may also be rejuvenated by pouring over the surface a thin layer of 2 per cent. agar plus a very weak rabbit dung infusion, a process which may be repeated several times.

Pure cultures of predacious hyphomycetes are often readily obtained from spores; if mould contamination is heavy easily accessible conidiophores may be secured by cutting a square of agar from the culture so that they may subsequently grow horizontally into the space. Trap formation is induced by adding the fungus in small quantities to a rich culture of eelworms, obtained by inoculating plates of rabbit dung infusion agar with fresh horse or sheep dung or other material containing nematodes. When further plates of eelworm inoculum are required portions of the original, free from predacious hyphomycetes, are used, and these in turn serve to inoculate plates of maize meal or normal strength rabbit dung agar for the addition of predacious fungi within a few days.

Haustoria of Zoopagaceae are of great diagnostic importance and should be preserved in formalin-acetic acid (10–5–85). They are difficult to see and require a high magnification; the vegetative stages may only last a few days. Living material is much more satisfactory than stained preparations for observation. Permanent mounts [cf. 30, p. 481] of the endozoic hyphomycetes are made by fixing an agar

fragment in formalin-acetic acid for 24 hours, washing well, soaking in saturated aqueous erythrosin for 24 hours, transferring to 10 per cent. glycerine plus 0·5 per cent. glacial acetic acid and allowing to concentrate, then dehydrating in a desiccator and mounting in glycerine or glycerine jelly. Fixed nematode-trapping hyphomycetes are stained in Delafield's haematoxylin, 'blued' in tap water or ammonia vapour, placed in 10 per cent. glycerine, which is allowed to concentrate, washed in industrial methylated spirit to remove all glycerine, dehydrated in absolute alcohol, placed in a 10 per cent. solution of Venetian turpentine in absolute alcohol in a dessicator, and finally mounted in the turpentine after it has concentrated for two days, using a cavity slide.

It is emphasized that new species of nematode-trapping hyphomycetes should be proposed with great caution owing to the lability of some species and the necessity of knowing the nature of the traps in addition to the spore forms.

Knowles (P. F.) & Houston (B. R.). **Inheritance of resistance to Fusarium wilt of Flax in Dakota selection 48–94.**—*Agron. J.*, 47, 3, pp. 131–135, 2 graphs, 1955.

At the University of California, Davis, the flax varieties Punjab (C.I. 20), Punjab 47 (C.I. 1115), and Dakota selection 48 90, susceptible to wilt (*Fusarium oxysporum* f. *lini*) [*F. lini*], were crossed with the highly resistant Dakota selection 48–94 and the progeny grown on soil naturally infested with wilt or inoculated with one of three 'wilt clones' [*R.A.M.*, 33, p. 154]. The complementary genes Fu_A and Fu_B (termed A and B) were found to be responsible for the resistance of Dakota 48–94 to wilt clones 294 and 287 and to natural infection at one site. Punjab, Punjab 47, and Dakota 48–90 have the genotype aabb. The complementary genes did not confer wilt resistance in a second naturally infested location nor to wilt clone 33–1 occurring there. Dakota 48–94 appeared to possess a major gene for resistance to this clone.

Marcelli (E.). **Il Coryneum microstictum B. et B. (Griphosphaeria corticola) quale agente di un cancro della Rosa nella zona di Napoli.** [*Coryneum microstictum* B. & B. (*Griphosphaeria corticola*) as the agent of a canker of Rose in the vicinity of Naples.]—*Notiz. Malatt. Piante*, N.S., *1955*, 8 (29), pp. 19–25, 7 figs., 1955. [English summary.]

At the Cryptogamic Laboratory and Phytopathological Observatory, Pavia, Italy, *Griphosphaeria corticola* [*R.A.M.*, 18, p. 597] was isolated from branches and leaves of tea roses growing in a garden near Naples. Inoculations of twigs and detached leaves of tea roses and *Rosa canina*, subsequently placed in a damp chamber, through incisions or by immersion in an aqueous suspension of the conidia, induced typical symptoms. The acervuli and conidia which developed were very variable, indicating the probable presence of several biotypes. The fact that the disease can be reproduced on both leaves and twigs does not justify the erection of a new leaf-inhabiting variety, as proposed by Dearness [8, p. 66].

Ciferri (R.). **Virosi delle Freesiae in Italia.** [Viroses of Freesias in Italy.]—*Notiz. Malatt. Piante*, N.S., *1955*, 8 (29), pp. 26–29, 1955. [English summary.]

Since 1946, freesia plants, largely of Dutch origin, growing in the Botanical Garden of the University of Pavia, Italy, have presented virus symptoms [*R.A.M.*, 34, p. 228], though the causal agent has not yet been determined.

The most conspicuous symptom is the failure of some or all of the flower buds to open [31, p. 385]. The petals of unopened inflorescences are half the usual size, forming an irregular fringe, and together with the sex organs, are variously atrophied. In coloured varieties the perianth becomes discoloured in irregular patterns. Affected plants are almost always small and stunted and the leaves and floral

bracts show varying mosaic patterns, marked as they first emerge and developing later into a general chlorotic discoloration. These symptoms are conspicuous in the variety Buttercup, which, however, is not very susceptible, while in an unidentified variety the chlorotic areas dry out, and Snow White may be severely affected.

Observations from 1946 to 1952 indicate that over 50 per cent. of the plants seen are usually affected, whether of Dutch or Italian origin.

Forsberg (J. L.). **The use of insecticides as corm and soil treatments for control of bacterial scab of Gladiolus.**—*Plant Dis. Reptr*, 39, 2, pp. 106–114, 6 figs., 2 graphs, 1955. [Multilithed.]

Further investigation of this problem [cf. *R.A.M.*, 33, p. 483] was carried out in Kankakee county, Illinois. Soil applications of aldrin, 20 per cent. granular, 5 gm.; lindane 25 per cent. wettable powder, 4 gm.; and heptachlor 2½ per cent. dust, 40 gm.; all per 10 ft. row, reduced gladiolus scab (*Pseudomonas marginata*) by about 90 per cent. and were more effective thus than as corm treatments. Mixed with arasan and applied dry they were better than as an emulsion and non-injurious. The fungicide emmi (N-ethylmercuri-1,2,3,6-tetrahydro-3,6-endomethane-3,4,5.6,7,7-hexachlorophthalimide) used as a corm treatment with lindane or aldrin caused some injury, but not with heptachlor.

Foster (Virginia). **A study of an Orchid root-rot fungus.**—*Diss. Abstr.*, 15, 6, pp. 950–951, 1955.

Two recently repotted *Cattleya* orchid plants suffered leaf wilt and abscission, root decay, and death of the pseudo-bulbs and rhizomes. At Ohio State University a fungus closely resembling *Fusarium orthoceras* var. *longius* [cf. *R.A.M.*, 32, p. 432] was isolated from surface-sterilized orchid fragments and from pieces of the *Osmunda* fibre from the stock used in the repotting. Similar symptoms developed in healthy *Cattleya* plants inoculated by pouring spore suspensions over the roots and pricking them with sterile needles; the pathogen was re-isolated from the rotted roots.

Jensen (D. D.) & Gold (A. H.). **Hosts, transmission, and electron microscopy of Cymbidium mosaic virus with special reference to Cattleya leaf necrosis.**—*Phytopathology*, 45, 6, pp. 327–334, 3 figs., 1955.

At the Departments of Entomology and Plant Pathology, University of California, Berkeley, *Cymbidium* mosaic virus [*R.A.M.*, 32, p. 129] has been shown to cause three distinct types of disease in *Cattleya*, *Cymbidium*, and *Datura stramonium*. In the first-named and related orchids the virus is responsible for leaf necrosis, expressed by rings, streaks, and irregular, sunken areas of brown to black necrotic tissue, mostly in the older foliage. The first symptoms usually appear between four and six weeks after inoculation. The flowers appear to be normal in shape and colour, but premature death of the infected leaves causes a reduction in size and number.

The symptoms of mosaic in *Cymbidium* have already been fully described [30, p. 469]. Foliar mottling is the most prominent feature, while brown, necrotic areas also develop in the older leaves of many plants. The virus assumes a systemic form in both *Cymbidium* and *Cattleya*. It is transmissible by sap inoculation through mechanical injury of the leaves and thus by pruning shears.

D. stramonium developed local lesions a fortnight after inoculation and should prove to be a useful indicator plant for *Cymbidium* mosaic virus, of which it is the first known non-orchidaceous host.

Electron micrographs demonstrated the similarity in shape and size of *Cymbidium* mosaic virus particles derived from *Cymbidium* [30, p. 610], necrotic *Cattleya*, and

inoculated *D. stramonium*. They were clearly distinct from the shorter, thicker, and more rigid elements associated with the ring spot virus of *Odontoglossum* [loc. cit.].

It is concluded that *Cattleya* necrosis differs from other recorded viroses of the same host described from Hawaii [33, p. 605] and the disease caused by *Cymbidium* necrotic ring spot (*Bull. Amer. Orchid Soc.*, 22, pp. 800–804, 1953). The incidence of infection in *Cattleya* plantings is likely to be much higher than that indicated by external signs at any given time, since symptom expression is irregular and tends to become milder after the initial 'shock' effect.

Brierley (P.), Smith (F. F.), & Doolittle (S. P.). **Some hosts and vectors of Tomato aspermy virus.** —*Plant Dis. Reptr.*, 39, 2, pp. 152–156, 1955. [Multilithed.]

Investigations by the Agricultural Research Service, Beltsville, Maryland, showed that tomato aspermy virus, causing injury to flowers of some chrysanthemum varieties [*R.A.M.*, 34, pp. 456, 724, and next abstract], could be transmitted between various hosts by *Macrosiphoniella sanborni*, *Myzus persicae*, and *M.* [*Aulacorthum*] *solani*. The last two acquired the virus after 15 minutes' feeding and lost infectiveness in two hours' starvation. Only *A. solani* transmitted the virus from chrysanthemum to chrysanthemum. On healthy tobacco plants *M. persicae* retained the virus for two hours or less and *A. solani* for 15 minutes or less. In inoculation experiments 38 species of 30 genera, representing 12 families, were found to be susceptible. No seed transmission was detected in China aster, tobacco, or *Nicotiana glutinosa*.

Hollings (M.). **Investigation of Chrysanthemum viruses. 1. Aspermy flower distortion.**—*Ann. appl. Biol.*, 43, 1, pp. 86–102, 1 pl., 1955.

At the Plant Pathology Laboratory, Harpenden, inoculations of 27 *Chrysanthemum indicum* seedlings with sap from tobacco plants infected with tomato aspermy virus [*R.A.M.*, 32, p. 483 and preceding abstract] gave four infected plants. Two bore single-type flowers, apparently normal, while the other two produced double flowers, some symptomless though infected, but most were bleached pink, with floret length and shape irregular in one plant; there was also much twisting and tubing, with white break lines on the mauve-pink florets of the other plant. Cuttings from the infected plants bore mostly distorted flowers in the following year, the symptoms being more severe. The virus was also transmitted to *C. indicum* by *Macrosiphum euphorbiae*.

Graft inoculations of different chrysanthemum varieties with scions from the experimentally infected seedlings and from commercial varieties confirmed previous observations that all cuttings from diseased stools are infected. The symptoms included colour break and bleaching in Tibshelf Orange, Sussex Pink, and Shirley Late Red; the colour of other varieties was unaffected, but all showed floret tubing, 'quilling', twisting, and irregularity. Affected flowers were small, and most were untidy or irregular. In American Spartan the central florets were greenish and undeveloped. The virus was recovered from the leaves, stems, flowers, and roots; sap from flowers was most infective and that from roots least. Cuttings from infected stools rooted almost as readily as those from healthy ones and produced vigorous plants.

Myzus persicae, *Macrosiphum euphorbiae*, *Aulacorthum solani*, *Brachycaudus helichrysi*, and *Macrosiphoniella sanborni*, all commonly infesting chrysanthemums, were ascertained to transmit the virus [loc. cit.], which was non-persistent. Spread by propagation methods was negligible and the virus was not transmitted through seed or soil. The symptoms presented by 27 species of test plants are briefly described.

The thermal inactivation point of the virus in tobacco sap lay between 65° and 70° C. Infectivity was reduced by heating for ten minutes at 55° and 60°. At room temperature infectivity decreased after 24 hours and was lost in seven to 14 days. The dilution end-point in tobacco leaf sap nine, 17, and 25 days after infection lay between 1 in 10,000 and 1 in 100,000 when celite and phosphate buffer were used in inoculations, falling to 1 in 1,000 to 1 in 5,000 after 60 days, though without any reduction in symptom severity. Using distilled water without celite it was between 1 in 2,500 and 1 in 10,000. In chrysanthemum leaf sap from young cuttings it lay between 1 in 500 and 1 in 2,500, and from mature leaves between 1 in 10 and 1 in 50. There was evidence of increased infectivity with dilution at 1 in 10, compared with undiluted or 1 in 2 sap. Chrysanthemum leaf sap was found to contain a virus inhibitor, though little or none was present in the flowers. No cross-protection was found in tests with three strains of cucumber mosaic virus, though comparisons indicated that the aspermy virus was related to four strains of cucumber mosaic, but less closely than these were to each other, and at present it is best regarded as distinct.

Control measures recommended include the thorough roguing of chrysanthemum stocks at flowering time, care in propagating new 'sports', which may only be aspermy-infected material, and the control of aphids, especially early in the season.

Orchard (W. R.). **Crown and stem rot of Pansy caused by Myrothecium roridum Tode.**—Abs. in *Proc. Canad. phytopath. Soc.*, 21, p. 15, 1953.

Since the discovery of the disease in 1947 the average yearly loss from crown and stem rot (*Myrothecium roridum*) in commercial pansy plantings in Vancouver Island [*R.A.M.*, 27, p. 555] has been 20 per cent. In inoculation tests *M. roridum* was pathogenic to the pansy varieties Swiss Giant, Royal Giant, and Giant Trinardeau, producing the typical symptoms of darkening of the crown tissues followed by a stem breakdown, wilting, and death. The optimum conditions for the growth of the pathogen in culture were pH 7·8 and 28° C. Rotations and plant sanitation measures are recommended for control.

Hansen (H. N.) & Bega (R. V.). **Botrytis rot of Caladium tubers.**—*Plant Dis. Reptr*, 39, 3, p. 283, 1955. [Multilithed.]

At the Department of Plant Pathology, University of California, Berkeley, *Botrytis ricini* was found to be responsible for a soft rot affecting 20 per cent. of a shipment of caladium (*Caladium bicolor*) tubers imported into California from Florida. In inoculation experiments the symptoms were reproduced in about a week. It is unknown how and when the disease occurs in the field, but it appears inadvisable to grow caladiums on ground previously cropped to castor bean (*Ricinus communis*), the usual host of *B. ricini* [cf. *R.A.M.*, 3, p. 377]. This is believed to be the first record of *B. ricini* on caladium.

Shurtleff (M. C.). **Brown patch of turf caused by Rhizoctonia solani.**—*Diss. Abstr.*, 15, 3, pp. 317–318, 1955.

Much of this information concerning brown patch of turf caused by *Rhizoctonia* [*Corticium*] *solani* has already been noticed from other sources [*R.A.M.*, 33, pp. 30, 728]. Of ten compounds tested at the University of Minnesota for their ability to inhibit sclerotial germination only puratized agricultural spray, caloclor, and calocure were effective. A high percentage of small sclerotia was killed by atomizing or dripping these compounds on them for 15 seconds. The larger ones were resistant to four times the normal concentration of mercury. Three applications of caloclor or calocure at 2 oz. in 10 gals. per 1,000 sq. ft. in late June and early July were as effective in controlling brown patch as eight sprays of the same compounds at the same rate at two-week intervals. Thirty-seven compounds were tested as chemotherapeutants by pouring them for ten consecutive days on the soil round potted

grasses ½ in. high, which were then inoculated. Phygon dissolved in ethanol, tersan 75 [containing thiram], the cupric salt of maleic hydrazide, endomycin, 8-hydroxyquinoline benzoate and sulphate, and captan 50 W all gave over 75 per cent. control without severe injury. When colonial bent [*Agrostis tenuis*] plugs were saturated with various compounds and inoculated with *C. solani* at intervals of up to 40 days later, tersan 75 and cupric maleic hydrazide gave over 50 per cent. control 20 days after treatment.

Schenk (R. V.) & Kennedy (W. K.). **Laboratory evaluation of fungicides for the preservation of moist hay.**—*Agron. J.*, 47, 2, pp. 64–69, 1 graph, 1955.

From 1949 to 1954 experiments were conducted in the laboratory at Cornell University Agricultural Experiment Station, Ithaca, New York, to evaluate fungicides for the preservation of moist hay [*R.A.M.*, 34, p. 39]. The method in general was to incubate 70 gm. of ground lucerne hay, dried and then rehydrated to contain 40 per cent. moisture and treated with the experimental chemical, for 11 weeks in a cotton-stoppered Erlenmeyer flask or in an 8-oz. screw-topped jar with a pierced top. The amount of mould growth, which was closely correlated with total loss of dry matter, was then estimated visually.

Of approximately 100 chemicals tested only one-third prevented moulding and many were effective only at heavy rates of application and did not warrant further testing. The chlorinated phenols, except for pentachlorophenol, were effective at 0·2 to 0·25 per cent.: of these 2,4,6-trichlorophenol [loc. cit.] is the least expensive. Salicylaldehyde, 5-chlorosalicylaldehyde, several of the halogenated aliphatic carbonyls, and methyl-2,3-dibromopropionate were effective at low rates of application while the halogenated aliphatic aldehydes and ketones with higher boiling points were effective at very low rates.

The above procedure is sufficiently rigorous to eliminate all but the more promising chemicals but these need further laboratory testing before being subjected to full field evaluation.

Bouriquet (G.) & Jauffret (J.). **Trois cryptogames se développant sur le Lemon Grass aux Comores.** [Three cryptogams growing on Lemon Grass on the Comoro Islands.]—*Agron. trop., Nogent*, 10, 4, pp. 523–532, 5 figs., 1955. [English and Spanish summaries.]

Curvularia lunata, *C. comoriensis* n.sp. [without a Latin diagnosis], and *Helminthosporium sacchari* [*R.A.M.*, 20, p. 229; 29, p. 477] were isolated in 1952 at the Technical Section of Tropical Agriculture, Nogent (Seine), France, from living leaves of lemon grass (*Cymbopogon citratus*) grown on the island of Moheli in the Comoro Archipelago [Mozambique Channel]. *C. lunata* and *H. sacchari* appear to be new records for lemon grass. In inoculation experiments *C. comoriensis* was the most virulent and caused heavy damage; *H. sacchari* caused a few, small spots; and *C. lunata* was intermediate in pathogenicity. *C. comoriensis* belongs to the *geniculata* section and has conidia averaging 51 by 16 μ.

Baxter (J. W.). **Diseases of forage legumes in Iowa in 1954.**—*Plant Dis. Reptr*, 39, 3, p. 239, 1955. [Multilithed.]

The following were most important pathogens on forage legumes in Iowa in 1954: *Ascochyta imperfecta*, *Cercospora medicaginis*, *Pseudopeziza medicaginis*, *Stemphylium botryosum* [*Pleospora herbarum*: see below, p. 21], *Corynebacterium insidiosum*, and *Leptosphaeria pratensis* on lucerne; the root rot complex of *Fusarium* spp. and other fungi, *Cercospora zebrina*, and *Kabatiella caulivora* on red clover; *A. lethalis*, *C. davisii*, *A. caulicola*, *L. pratensis*, and *Colletotrichum destructivum* on sweet clover [*Melilotus* spp.: *R.A.M.*, 33, p. 637]; and *Rhizoctonia* [*Corticium*] *solani* on leaves, stems, and crowns of bird's foot trefoil [*Lotus corniculatus*].

KLOMPARENS (W.). **A study of Helminthosporium sativum P.K. & B. as an unreported parasite of Agrostis palustris Huds.**—*Diss. Abstr.*, 15. 6. p. 951, 1955.

Helminthosporium sativum was constantly associated with an extremely destructive disease of creeping bent grass (*Agrostis palustris*) [cf. *R.A.M.*, 33. p. 429] which turned large areas smoky blue and chlorotic before they were finally destroyed. Fifty-eight isolations were obtained from sources ranging from Texas to Ohio. *Pleosphaerulina* sp. was also parasitic on this host and *Curvularia* sp. [33. p. 30] mildly so.

HAWN (E. J.). **Development of Alfalfa crown bud rot.**—Abs. in *Proc. Canad. phytopath. Soc.*, 21, p. 13, 1953.

During 1952 80·6 per cent. of the annual increase in the incidence of lucerne crown bud rot (associated with *Rhizoctonia* [*Corticium*] *solani* and *Fusarium* spp.) in field plot experiments in Alberta [*R.A.M.*, 32. p. 486] occurred in May, confirming the conclusion that this disease is at its worst in the early part of the growing season.

NELSON (R. R.). **Studies on Stemphylium leafspot of Alfalfa.**—*Phytopathology*, 45, 7, pp. 352–356, 1 fig., 1955.

Further studies at the Department of Plant Pathology, University of Minnesota, on the leaf spot of lucerne caused by *Stemphylium botryosum*, generally regarded as the imperfect state of *Pleospora herbarum* but recently shown to be connected also with *Pseudoplea briosiana* [*R.A.M.*, 33. p. 357], were mainly concerned with pathogenicity.

The fungus overwinters chiefly in the form of immature perithecia on plant refuse and in dormant host tissues. Symptoms from ascospore infections [20. p. 306; 33. p. 430] appear in the early spring, and the ascospore to ascospore cycle is repeated several times until the beginning of July, after which perpetuation is effected almost entirely by means of conidia. The leaflets, stems, petioles, peduncles, pods, and seeds are infected, with resultant defoliation, wilting, and dwarfing, sometimes followed by death of the entire stem. In greenhouse tests some 70 per cent. of the diseased leaflets were shed.

The leaf spot reduces both yield and quality of the seed, the former through the production of fewer pods and fewer and lighter seeds and the latter by poor germination and discoloration and shrivelling of the seed. Moisture and temperature largely decide the potential importance of the disease in any given year. The optimum conditions for initial infection are temperatures ranging from 18° to 24° C. and at least 12 hours' 100 per cent. relative humidity. The further development of the pathogen is promoted by moderate temperatures.

In comparative inoculation experiments with conidia and ascospores, the former infected a larger number of forage species and were more pathogenic than the latter. *Medicago hispida*, *Melilotus officinalis*, and alsike clover were highly susceptible to the conidial isolates, which caused little damage, however, on red, Ladino, and white clovers, and did not attack *Lotus corniculatus*. *Medicago hispida* and *Melilotus officinalis* were the only two species besides lucerne infected by the ascospore isolates. This is the first time *M. officinalis* has been identified as a host of *P. briosiana*.

KREITLOW (K. W.) & YU (HELEN S.). **Curvularia leaf blight of Red Clover.**—*Plant Dis. Reptr.* 39, 2, pp. 181–182, 1 fig., 1955. [Multilithed.]

Leaf blight of red clover due to *Curvularia trifolii* has been observed in Maryland and California since 1950. The fungus was identical culturally, microscopically, and in pathogenicity with that causing leaf blight of Ladino clover [*R.A.M.*, 30. p. 470]. Lesions on red clover leaves develop as large, yellowed areas, becoming watery grey, translucent, and finally light brown, and resemble the damage caused by scorch and southern anthracnose (*Kabatiella caulivora* and *Colletotrichum trifolii*).

Yu (Helen S.) & Kreitlow (K. W.). **A leafspot of Lotus uliginosus caused by Cercospora loti.**—*Plant Dis. Reptr*, 39, 3, pp. 236–238, 1 fig., 1955. [Multilithed.]

Cercospora loti, previously reported only from Hungary (*Ann. Mus. nat. Hung.*, 5, pp. 452–468, 1907), was found to be responsible for leaf spot and defoliation of *Lotus uliginosus* at Beltsville, Maryland, and Alapaha, Georgia, in 1954. In pathogenicity experiments in which plants in a moist chamber were sprayed with culture macerates, the fungus attacked the leaves and stems, ultimately killing the shoots. *L. uliginosus* was considerably more susceptible than *L. corniculatus* or *L. tenuis*.

Cropley (R.). **The selection of virus-free clones of fruit plants in Britain.**—*Sci. Hort.*, 11 (*1952–54*), pp. 75–97, 4 pl., 2 figs., 1955.

This article summarizes detailed information, culled from a bibliography of 66 references, on the precise grafting techniques, with indicator species and test varieties most suitable for each type of fruit crop, for the detection of viruses and selection of virus-free clones.

Wormald (H.). **Diseases of Fruits and Hops. Third edition.**—322 pp., 49 pl. (1 col.), 24 figs., London, Crosby Lockwood & Son, Ltd., 1955. 25*s*.

The present entirely revised edition of this important manual [cf. *R.A.M.*, 18, p. 398] comprises information on the latest developments in the treatment of diseases of fruits and hops, besides incorporating valuable new data, especially in relation to viroses.

Creuzburg (U.). **Kann die Schorfwirkung durch Spritzungen in die Blüte verbessert werden?** [Can scab control be improved by spraying at flowering?]—*Pflanzenarzt*, 8, 4, p. 29, 1955.

Fungicide deposits from pre-blossom applications on apple may fail to afford protection against scab [*Venturia inaequalis*: *R.A.M.*, 33, p. 608] during the flowering period if this is delayed or prolonged by bad weather. Near St. Georgen, Austria, ten-year-old Golden Pearmain trees given two pre-blossom applications of copper oxychloride in 1954 yielded 30 per cent. more scab-free apples than when one of copper oxychloride was followed by wettable sulphur.

Palmiter (D. H.) & Hamilton (J. H.). **Influence of certain nitrogen and fungicide applications on yield and quality of Apples.**—*Bull. N.Y. St. agric. Exp. Sta.* 766, 41 pp., 1 fig., 1 diag., 1954.

The results are presented of experiments conducted from 1943 to 1951 in New York State to determine the effect of various soil and foliage applications of nitrogenous materials, particularly urea (as uramon or nugreen) combined with a wettable sulphur, on apple yield and scab (*Venturia inaequalis*) control [*R.A.M.*, 34, p. 376 and next abstract], fruit quality, and orchard vigour. The inclusion of urea 5–100 in the first three pesticide sprays following bloom maintained the trees at a satisfactory level of nitrogen nutrition in a moderately vigorous orchard. Fruit drop increased as the nitrogen level rose with both foliage and soil applications. There was some injury following urea concentrations above 24 lb. in 100 gals. spray. Trees receiving foliage applications of urea sustained less scab than those receiving soil nitrogen together with the sulphur sprays, and those receiving fermate without additional nitrogen outyielded those sprayed with wettable sulphur with or without supplementary nitrogen. The continuous use of sulphur and lead arsenate without lime lowered the soil pH to an undesirable level. The fermate-sprayed trees maintained their yield without the nitrogen level being raised, and thus were more resistant to scab; they also dropped less fruit at harvest and it was of better colour, firmer, and larger than that from sulphur-sprayed trees treated with nitrogen to maintain yield.

Palmiter (D. H.) & Smock (R. M.). **Effect of fungicides on McIntosh Apple yield and quality : a five-year study under Hudson Valley conditions, 1949–1953.**—*Bull. N.Y. St. agric. Exp. Sta.* 767, 40 pp., 1 fig., 5 graphs, 1954.

Eight fungicidal treatments, previously established as controlling apple scab (*Venturia inaequalis*) [see preceding abstract], were applied from 1949 to 1953 in the Hudson Valley, New York, in conjunction with a uniform lead arsenate spray schedule to compare their effect on yield and fruit quality. They included micronized wettable sulphur, micronized plus lime, Everett flotation sulphur paste, the same for pre-cover sprays followed by fermate (ferbam) for cover sprays, and crag 341 (glyodin), fermate, dichlone, or tag 331 for the pre-cover followed by fermate for the cover applications.

An average of five timely applications of the fungicides alone at full strength between dormancy and petal-fall, followed by six in combination with the insecticide gave excellent scab control (less than 3 per cent. incidence over the whole period), while the unsprayed trees were 100 per cent. infected each year. The all-season fermate treatment was the safest on McIntosh but sulphur in the early applications resulted in little difference in the production of quality fruit. Everett flotation sulphur paste followed by fermate as a cover was superior in yield and fruit quality to all-season sulphur, while the addition of lime to micronized wettable sulphur improved disease control, fruit size, colour, and yield, and reduced spray injury. Wettable sulphur and crag 341 tended to advance fruit maturity, while fermate and dichlone and tag, the last two followed by fermate, tended to retard it. Fermate-sprayed fruits sometimes tended to sustain more storage scald than those receiving other treatments. While the cost per acre for the organic fungicides (up to $53.50) was greater than for sulphur materials, the use of fermate alone or combined with sulphur increased the production of U.S. No. 1 fruit sufficiently to justify the additional expense.

Fothergill (P. G.) & Ashcroft (Rosalind). **The nutritional requirements of Venturia inaequalis.**—*J. gen. Microbiol.*, 12, 3, pp. 387–395, 1955.

In a co-operative study at King's College and the Royal Victoria Infirmary, Newcastle upon Tyne, the apple scab pathogen *Venturia inaequalis* [*R.A.M.*, 33, p. 487] achieved maximum growth after 30 days at 20° C. on a liquid medium of pH 5·8 containing 0·004 M potassium monohydrogen phosphate, 0·002 M magnesium sulphate, 0·0375 M ammonium nitrate, 4 per cent. (w/v) glucose, 2 p.p.m. zinc and manganese, thiamine, pyridoxine, and nicotinic, folic, and ascorbic acids. Very little growth occurred without thiamine or pyridoxine. Raffinose and cellobiose were the best carbon sources, but glucose also gave good mycelial growth. Statistical analysis of factorial experiments indicated that a correct balance between the mineral constituents of the medium and the carbon and nitrogen sources is essential to obtain dense mycelial growth.

Taylor (J.). **Apple black rot in Georgia and its control.**—*Phytopathology*, 45, 7, pp. 392–398, 2 figs., 1955.

A study initiated during 1952 at the Georgia Mountain Experiment Station revealed symptoms of apple black rot (*Physalospora obtusa*) and phases in the life-history of the fungus not hitherto reported [*R.A.M.*, 33, p. 90]. Platings made from fruit parts on water agar from 1952 to 1954 showed that infection may occur throughout the season from bud-break until harvest.

The small, purple spots appearing in early spring on the leaves and sepals enlarge and develop tan centres. Secondary growth results in a frog-eye spot on the leaves and a blossom-end rot on the fruit. The first signs of fruit infection are purple pimples which rupture slightly and cause decay with advancing maturity. Late-season infections originate as irregular, black spots which expand slowly while

the fruit is green and increase progressively as it ripens. The core-rot phase, characterized by premature colouring and shedding of the fruit, develops three to six weeks before harvest and may cause substantial loss in the Red Delicious variety.

Used in conjunction with the necessary sanitary precautions, captan (2 in 100) gave economic control on the Detroit Red variety. Applications were made at six- to eight-day intervals from the onset of the pre-pink stage until the end of petal-fall and thenceforth every fortnight.

The results of inoculation experiments demonstrated the importance of maturity; April infections will not cause severe fruit rot until four to eight weeks before harvest, whereas inoculated ripe fruit will be completely decayed in three to five days.

Lafon (R.) & Messiaen (C. M.). **Biologie du fly-speck des Pommes.** [The biology of Apple fly-speck.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 5, 3, pp. 311–322, 5 figs., 1954 [1955].

An account is given of the biology of the sterile form, natural hosts, and life-cycle of the apple fly-speck fungus (*Leptothyrium pomi*) [cf. *R.A.M.*, 34. p. 97] which was widely present in an orchard near Bordeaux in 1951. It was found on a number of hosts additional to those recorded in North America [cf. 10, p. 390]. Cultures on sterile cellophane placed on prune medium produced colonies identical with those found on apples, and the development of the mycelium in a single plane facilitated observation of the formation of the stromata. On various wild bushes, and especially on blackberry (*Rubus* sp.), fructifications of what appeared to be the perfect state, *Microthyriella rubi* [21, p. 226], were observed for the first time in France in 1952. The life-cycle runs from the release of the ascospores at the end of May until the formation of perithecia in the following spring.

Beraha (L.), Wilson (R. A.), & Dunegan (J. C.). **A comparison of different fungicides for the control of Apple powdery mildew in 1954.**—*Plant Dis. Reptr*, 39, 2, pp. 132–133, 1 fig., 1955. [Multilithed.]

Apple powdery mildew (*Podosphaera leucotricha*) [*R.A.M.*, 33. p. 303] is reported to have been unusually prevalent during the last few years on Jonathan and Rome Beauty apple trees in the eastern United States.

Sulphur preparations being no longer popular owing to their toxicity to the trees, new sprays are being tested at Beltsville, Maryland. Karathane spray ($\frac{3}{4}$ lb. per 100 gals.) reduced infection to 18·7 per cent. and wettable sulphur (6 lb.) to 8 per cent., compared with 55·4 for trees sprayed with water; vancide F 995 W (manganese salt at 2 lb.) was somewhat similar to karathane, but actidione caused extensive leaf injury.

Collyer (Elsie) & Kirby (A. H. M.). **Some factors affecting the balance of phytophagous and predacious mites on Apple in south-east England.**—*J. hort. Sci.*, 30, 2, pp. 97–108, 1955.

At East Malling Research Station, lime-sulphur, dispersible sulphur, 2-heptadecylglyoxalidine (341 SC), and captan were used as spring sprays from 1951 to 1953 on Cox's Orange Pippin and Worcester Pearmain, which received no winter washes. During this period predatory *Typhlodromus* mites increased in the first year on trees given organic fungicide and remained high, rose to a less extent on those given dispersible sulphur, but were low and decreased each spring on the lime-sulphur plots. Insect predators were not significantly affected and varied in density with red spider (*Metatetrarhynchus ulmi*) incidence, which though high when the experiment began was reduced on all plots, particularly in June 1952. Thereafter *M. ulmi* remained low on the organic plots, but increased on the lime-sulphur ones

sufficiently to bronze Worcester Pearmain foliage in 1953 [cf. *R.A.M.*, 34, p. 599]. If *T.* mites are reduced by winter or spring washes, they will fail to control *M. ulmi*.

Clayton (C. N.). **Streptomycin for fire blight control on Apple in North Carolina.**—*Plant Dis. Reptr*, 39, 2, pp. 128–131, 1 fig., 1955. [Multilithed.]

In field trials at McCullers Branch Experiment Station, North Carolina, five streptomycin formulations were compared for the control of fireblight (*Erwinia amylovora*) on inoculated apple trees of the varieties Gallia Beauty and Golden Delicious [*R.A.M.*, 34, pp. 729, 793, and next abstract]. Agrimycin-100 (15 per cent. streptomycin plus 1·5 per cent. terramycin), streptomycin nitrate (11·8 per cent. streptomycin), streptomycin formulation STS soluble (54 per cent.), and streptomycin formulation STD insoluble (10 per cent.) reduced infection by about 50 per cent. Three applications of streptomycin at 100 p.p.m. during bloom were more effective than at 50 p.p.m. Foliar injury, which was visible a few days after spraying, disappeared after several weeks.

Mills (W. D.). **Fire blight development on Apple in western New York.**—*Plant Dis. Reptr*, 39, 3, pp. 206–207, 1 graph, 1955. [Multilithed.]

Data examined at the New York State College of Agriculture, Ithaca, indicated that the development of apple fireblight (*Erwinia amylovora*) [see preceding and next abstracts] in the Lake Ontario fruit counties since 1917 required maximum daily temperatures during flowering of over 65° F., with precipitation or very high humidity. It is suggested for trial purposes that the first streptomycin spray should be applied during flowering on the first day when this temperature is exceeded and precipitation or high humidity is forecast, or, should such conditions fail to appear, at full bloom; this should give protection for up to seven days. When trees are sprayed early, further applications should follow in four to seven days depending on the development of the flowers and the temperature. If rain follows immediately after spraying the treatment should be repeated as soon as temperature and humidity favour infection.

Harris (R. W.) & Griggs (W. H.). **Russeting of Bartlett Pears.**—*Calif. Agric.*, 8, 3, pp. 6, 16, 1 graph, 1954.

Experiments carried out on Bartlett pears in the Sacramento Valley have shown that russeting is not due primarily to the copper applications used for the control of fireblight [*Erwinia amylovora*: *R.A.M.*, 34, p. 378 and next abstract] during blossoming. Less russet was observed on pears which developed on branches protected by bagging than on exposed fruit, regardless of copper application. Streptomycin [loc. cit.] showed promise in reducing the incidence of russet and would be useful if effective in controlling fireblight. The true cause of this russeting remains to be discovered.

Harris (R. W.) & Griggs (W. H.). **The effect of copper and streptomycin on russeting of Bartlett Pears.**—*Proc. Amer. Soc. hort. Sci.*, 65, pp. 155–166, 2 figs., 3 graphs, 1955.

The results of tests in two Bartlett pear orchards in the Sacramento Valley and one in Placer county, California, during 1953 and 1954 showed that copper dusts applied to control fireblight [*Erwinia amylovora*: see preceding and next abstracts] did not cause the fruit russeting present. Under the standard schedules for these orchards the rate per application of metallic copper varied from 0·7 to 2·1 lb. per acre. Regardless of treatment the longer the fruit was bagged during blossoming and blight control the less russet developed, probably as it was protected from unfavourable climatic conditions. There was no apparent correlation between

weather conditions at the time of spray applications and russet incidence, but the latter was inversely proportional to the duration of bagging regardless of the weather. Only two treatments, viz., a basic cupric zinc sulphate with DDT and wettable sulphur, used in Placer county, and tribasic copper sulphate, applied at Marysville, Sacramento Valley, at 4 lb. metallic copper per acre, definitely increased russeting as compared with fruit on unsprayed trees. Although there was less russet on trees dusted with streptomycin [cf. loc. cit.], sprayed trees showed no reduction.

KIENHOLZ (J. R.). **Control of fireblight on Forelle Pears with antibiotics at Hood River, Oregon.**—*Plant Dis. Reptr*, 39, 3, pp. 208–209, 1 graph, 1955. [Multilithed.]

At Hood River, Oregon, good control of pear fireblight (*Erwinia amylovora*) [see preceding abstracts] on the highly susceptible Forelle was given by 100 p.p.m. streptomycin in a mixture with 10 p.p.m. terramycin, (agrimycin-100) or as streptomycin sulfate (soluble), or nitrate, applied with a hand gun at a pump pressure of 500 lb. per sq. in. five times from 23rd April (80 per cent. bloom) until 11th June, and by four speed-sprayer applications of insoluble streptomycin sulphate. The average number of blight infections per tree was reduced from almost 11 (untreated check) to one or less, with no injury to the fruit and only traces of a leaf chlorosis. The treatments compare favourably with copper sprays, which cause severe fruit russet on Forelle [loc. cit.].

PETERSEN (D. H.) & DUNEGAN (J. C.). **Factors influencing the control of Peach scab in South Carolina.**—*Plant Dis. Reptr*, 39, 2, pp. 134–140, 1955. [Multilithed.]

Experiments on the control of peach scab (*Cladosporium* [*Fusicladium*] *carpophilum*) [*R.A.M.*, 33, p. 240], involving 31 treatments on Southland trees, were carried out in 1954 at Trenton, South Carolina. In general, they confirm previous findings. The importance of applying sulphur sprays without lime four to six weeks after petal fall is again stressed and, if this is not possible, of increasing the sulphur rates in later sprays from 6 to 12 lb. per 100 gals. water. Lime alone gives no control, but is more effective when mixed with lead arsenate or zinc sulphate. A mixture of all three compounds was ineffective.

FINK (H. C.). **Prunus tomentosa as an index plant for sour Cherry viruses.**—*Phytopathology*, 45, 6, pp. 320–323, 3 figs., 1955.

In comparative greenhouse tests at the Iowa Agricultural Experiment Station, *Prunus tomentosa* seedlings and Montmorency cherry trees were inoculated with 19 sources of necrotic ring spot virus [*R.A.M.*, 34, p. 379], three of prune [plum] dwarf virus [33, p. 736], and one of peach rosette mosaic virus [30, p. 329]. Both index plants reacted to all sources of necrotic ring spot (abs. in *Phytopathology*, 40, p. 9, 1950) and plum dwarf, and *P. tomentosa* also gave a positive response to peach rosette mosaic, whereas cherry did not.

In the field, *P. tomentosa* proved to be a more suitable indicator plant for virus detection than Elberta peach, buds from all the 111 Early Richmond sour cherry trees used inducing typical symptoms on the former host compared with only 45 on the latter. Of 119 seed trees of *P. mahaleb*, 10 were positive on *P. tomentosa* and seven on peach. Chlorosis was the predominant symptom of infection on *P. tomentosa* in the field, with or without some degree of necrosis, while peach seedlings reacted principally by stunting and rosetting of new growth.

It is apparent from these data that *P. tomentosa* is at least equal, if not superior, to Montmorency cherry as an indicator of necrotic ring spot and other viruses in cherry, and serves the purpose much better than Elberta peach. *P. tomentosa* is

readily propagated from seed and the seedlings may be used for indexing at the age of one year.

Wilson (E. E.) & Wagnon (H. K.). **A Peach disorder possibly related to the virus bud failure disease of Almond.**—*Phytopathology*, 45, 6, pp. 323–326, 2 figs., 1955.

Peach trees in central California are affected by a disorder for which the name 'mule's ear' is proposed. The leaves developing in early June are stiffly erect and often partially folded in contrast to the outward and downward curvature on normal trees. Other symptoms include abnormal tapering towards the apex and an unusually pale green coloration of the foliage, while abnormal retention of the leaves in the autumn facilitates diagnosis at the time. In the spring many of the previous summer's axillary buds fail to grow, and in other cases no macroscopically visible buds form in the upper portion of the current growth. 'Mule's ear' is frequently confined to branches of one scaffold limb, but it may also involve others and sometimes the entire top, the number of affected branches increasing slowly from year to year. Fruit production is lower and maturity is reached about a week later than in normal trees, while occasional fruits may be malformed.

The only description of a peach or nectarine disease characterized by a 'mule's ear' posture of the leaves is that named 'peak wild-leaf strain' or 'wild leaf' by Shamel *et al.* in California (*Circ. U.S. Dep. Agric.* 212, 21 pp., 1932). In 1952 'mule's ear' was encountered on the same property which these authors had examined, and by 1954 it had been recorded on 15 properties in eight counties of the State. The new disorder resembles 'willow twig' (*Handbk U.S. Dep. Agric.*, 10, pp. 95–97, 1951) in its effects on the buds and on autumnal defoliation, while Drake almond bud failure [*R.A.M.*, 24, p. 324] induces on almonds most of the characteristic symptoms of 'mule's ear' on peach. In August, 1949, 15 almond and 15 peach seedlings were inoculated with buds from almond trees affected by bud failure, and by 1952 the typical 'mule's ear' posture had developed in 12 of the former and 14 of the latter.

Alcorn (S. M.) & Ark (P. A.). **The antibiotic candicidin, a protectant dip against brown rot infection of Peach fruit.**—*Plant Dis. Reptr*, 39, 3, pp. 210–212, 1 fig., 1955. [Multilithed.]

At the Department of Plant Pathology, University of California, Berkeley, peach fruits given a ½-hour dip in 1 in 16,666 aqueous candicidin [*R.A.M.*, 34, p. 307] and stored at 32° F. for three and 21 days before inoculation with *Monilinia* [*Sclerotinia*] *fructicola* [34, p. 530] developed 0 and 16 per cent. infection, respectively, compared with 22 per cent., with 1 in 33,333 candicidin (stored for three days only), and 66 to 100 per cent. with 1 in 5,000 captan. Liquid lime-sulphur gave no protection. A five-minute dip in 1 in 33,333 candicidin was superior to captan and lime-sulphur when fruits were inoculated shortly after treatment or after three days' storage at 32°. Storing for three days at room temperature between treatment with 1 in 16,666 candicidin and inoculation resulted in 25 per cent. infection in four trials as against 0 per cent. in one trial with captan and 88 per cent. in three with lime-sulphur. Captan, however, caused serious fruit injury. When 1 in 16,666 candicidin solution was used after keeping for two weeks at room temperature 11 of the 12 fruits inoculated shortly after a ½-hour dip remained healthy during two weeks' storage.

Wensley (R. N.). **Preliminary microbiological investigations on the Peach replanting problem.**—Abs. in *Proc. Canad. phytopath. Soc.*, 21, p. 19, 1953.

Preliminary investigations of the failure of peach trees replanted in old orchard areas in south-western Ontario are being undertaken at the Harrow Science Service Laboratory. Peach trees do not fail when planted after sour cherry, the rhizosphere

fungus flora of which was found to contain 42 per cent. *Penicillium* spp. and 51 per cent. *Fusarium* spp. In a Science Service Elberta peach orchard the predominant species were 47 per cent. *Aspergillus*, 17 per cent. *Paecilomyces*, and 11 per cent. *Penicillium*.

Peach root tissue from ten failing orchards consistently contained a phycomycetous mycorrhizal fungus unaffected by ethylene dibromide soil fumigation.

Delmas (H. G.). **La rouille de l'Abricotier en Roussillon.** [Apricot rust in Roussillon.]—*Phytiatrie-Phytopharm.*, 4, 1, pp. 31–44, 2 pl., 1955.

After mildew (*Podosphaera oxyacanthae* var. *tridactyla*) [*R.A.M.*, 33, p. 160], rust (*Tranzschelia* [*Puccinia*] *pruni-spinosae*) [loc. cit.] does most damage to apricot tree foliage in Roussillon, France. Leaves fall prematurely and trees may be almost completely defoliated in July, or even by the end of June, forcing the dormant buds to growth, the new leaves in turn being invaded by rust. Flowering is markedly decreased, fruits fall early, and the yield is greatly reduced.

Treatment trials made in 1953 confirmed the efficacy of micronized wettable sulphur observed in previous years. Zineb and ziram had more lasting effects, but are not recommended in Roussillon owing to the frequency and severity of mildew attack.

Sulphur, zineb, and ziram equally protected the foliage against rust for over six weeks after the last application. After two months rust became visible on sulphur-treated trees, whereas those given zineb resisted satisfactorily, while after three months the latter had retained most of their foliage, whereas the former had defoliated branch tips. The effect of ziram was intermediate. Despite this apparent advantage trees treated with zineb or ziram were progressively invaded by mildew and by the end of summer all leaves were covered with mycelium and often partly dead, sulphur-treated trees suffering to a much lesser degree; sulphur damage was practically nil on Rouge du Roussillon and Bulida in all tests made during the last four years. On economical grounds, too, zineb should be replaced after harvest by two sulphur applications, one immediately and a second one month later. Micronized sulphur (800 gm. active substance per hl.), as used in the trials, was entirely satisfactory.

A suggested programme includes five sulphur treatments for Rouge du Roussillon (flowering in the first half of March; harvest, second half of June), three from mid-April to mid-May, one at the end of June just after picking, and one four to five weeks later; for Bulida (harvested in the first half of June) the times should be middle and end of April, after harvest, and again five or six weeks later. In order to avoid rust infection before and during harvest zineb should be mixed with the last sulphur treatment, one month before picking, and followed by two micronized sulphur applications at intervals of one month.

Natal'ina (Mme O. B.), Voronkevich (I. V.), & Kuznetsova (Mme A. I.). Новая бактериальная болезнь Малины. [A new bacterial disease of Raspberry.]—Докл. Акад. Наук СССР [*C. R. Acad. Sci. U.R.S.S.*], 99, 3, pp. 483–484, 1 fig., 1954. [Received October, 1955.]

A new disease of raspberry caused by *Ps*[*eudomonas*] *rubi idaei* n.sp., differing physiologically and pathogenically from all known causal agents of bacteriosis [*R.A.M.*, 15, p. 204], is reported from a suburb of Saratov, U.S.S.R., where it was first noticed in 1952. On the leaves small (0·5 to 1 mm. in diameter) transparent spots appear which become larger, more distinct, and oily with brown centres; on dying, an oily halo is left round the dead tissue. When infection is severe the spots coalesce, the infected tissue dies and drops out leaving a shot-hole effect. Necrosis often spreads to the leaf margin. The bacterium was isolated in pure culture and disease symptoms reproduced in inoculation experiments.

The bacterial rods measure 1·6 to 1·9 by 0·4 to 0·6 μ. On MPA [? meat peptone agar] it produces a slightly convex, shining, thin, yellow coating of a pasty consistency, while in MPB [? meat peptone broth] it produces turbidity without a film. It is Gram-negative, producing acid but not gas from glucose, galactose, saccharose, maltose, and glycerine, but no acid from lactose; liquefying gelatin, coagulating and peptonizing milk, converting nitrates into nitrites, but not reducing starch or producing indole.

At present the disease is not widespread.

Frazier (N. W.). **Tobacco necrosis virus on Strawberry.**—*Plant Dis. Reptr*, 39, 2, pp. 143–147, 1955. [Multilithed.]

At the Dominion Plant Pathology Laboratory, Summerland, British Columbia, tobacco necrosis virus was recovered from the roots, but not from the foliage, of most of the greenhouse-grown indicator strawberry (*Fragaria vesca*) plants tested. Some were from seed and others from established clones [*R.A.M.*, 32, p. 88]. The necrosis symptoms could not be induced in inoculated strawberry leaves. Of 80 field-grown commercial and wild strawberry plants from 23 localities, only one yielded the virus, but nine of the remaining 79 virus-free plants became infected after four months in the greenhouse. The virus was recovered from the roots of daughter plants on stolons developing freely on a moist redwood bench surface. The data obtained indicated that tobacco necrosis virus was not systemically transmitted to daughter plants through stolons, it did not become systemic in the strawberry root system, and moist redwood bench surfaces and non-sterile clay pots were sources of the virus. Infection of strawberry roots with tobacco necrosis virus did not apparently influence the expression of symptoms of strawberry mottle virus.

Frazier (N. W.). **Strawberry vein banding virus.**—*Phytopathology*, 45, 6, pp. 307–312, 1 fig., 1955.

In 1949 a virus causing distinct veinbanding symptoms was isolated from a Marshall strawberry plant and two hybrids at the Strawberry Institute of California, near Morgan Hill. The Alpine variety served as the most useful indicator plant of 30 on which the symptoms of infection were compared. The virus proved to be transmissible by means of dodder (*Cuscuta subinclusa*), grafting, and the aphids *Amphorophora rubi*, *Capitophorus* [*Pentatrichopus*] *fragaefolii*, *Macrosiphum* [*Acyrthosiphon*] *pelargonii*, and *Myzus ornatus*. In comparative tests with six colonies of *P. fragaefolii*, each from a different locality, two colonies of dark aphids, collected on wild woodland strawberry (*Fragaria californica*), and two pale colonies acted as efficient vectors of the virus, whereas two other pale ones failed to transmit it.

A 30- but not a 20-minute feeding period sufficed for the acquisition of the virus. Only a few aphids became infective in the 30- and 60-minute feeding periods (two out of 44 and one out of 51, respectively), but there was a sharp increase with an extension up to two hours (24 out of 51). The virus was transmitted to the first test plant within a 30-minute test feeding period following acquisition feeding. It was retained for a minimum of eight but not for 24 hours by aphids that had completed one- or four-day acquisition feeding periods. The incidence of transmission was lower after the four than after the one-day acquisition feeding period (19 as compared with 32 out of 92 inoculated plants).

Although the veinbanding virus is considered to differ from any previously described, it presents certain analogies with Prentice's viruses 4 and 5 [strawberry vein chlorosis and strawberry leaf curl: *R.A.M.*, 32, p. 573] and also with Zeller and Vaughan's strawberry crinkle [11, p. 792].

Wilhelm (S.). **Verticillium wilt of the Strawberry with special reference to resistance.**—*Phytopathology*, 45, 7, pp. 387–391, 1 fig., 1955.

A method is reported from the Department of Plant Pathology, University of

California, Berkeley, for the rapid elimination of strawberry plants susceptible to *Verticillium albo-atrum* from a mixed population, thereby obviating a major difficulty in the accurate testing of individuals [*R.A.M.*, 29, p. 571]. After washing, roots of two- to three-month-old seedlings or one-year nursery plants are dipped in a suspension of a virulent culture of the pathogen of single-spore origin and planted in 4-in. pots in a soil mixture known as the John Innes mix, in which a consistent and fairly high nitrogen level is maintained by decomposition of hoof and horn grist, while initial partial sterilization is effected by chloropicrin [33, p. 508]. Under local conditions the first inoculation is performed in March or April, when the weather tends to fluctuate from cool and overcast to warm and clear.

Susceptible plants began to wilt within six to eight weeks, a culture being made in each case from one of the petioles, which often bore pronounced black streaks on both surfaces. Plants surviving the first inoculation or reacting ambiguously were reinoculated, usually after eight weeks, by spraying the exposed roots with a spore suspension during transference to 6-in. pots. Plants showing symptoms after either the first or second inoculation and yielding the fungus in culture were ranked as susceptible. Survivors of the second inoculation were inoculated a third time on transference to 8-in. pots and those developing symptoms (usually mild at this stage) were classed as tolerant and discarded. Individuals withstanding all three inoculations were placed in the resistant group, five petioles of each being cultured to determine whether or not invasion had occurred. The following year these plants, both invaded and fungus-free, were bare-rooted and the crowns divided. One crown division of each was planted in the field in contaminated soil, while a sister crown was reserved for further greenhouse testing.

Progenies of 13 crosses and several other selfed populations, together with asexual clones of some commercial strawberry varieties and *Fragaria* spp., were studied. The offspring of susceptible × susceptible, susceptible × resistant, and resistant × resistant parents comprised, respectively, 0, 8·3 to 20·8, and 21 to 53 per cent. resistant plants. In general, plants rated as wilt-resistant in the greenhouse developed no symptoms in infested field soil, while those classed as resistant but invaded usually overcame the infection under comparable conditions.

Factors for resistance to *V. albo-atrum* appear to be dominant (over those for susceptibility) and quantitative (as evinced by the expression of degrees of tolerance or resistance). Evidently, too, they are closely linked with other factors responsible for resistance to powdery mildew of the foliage [*Sphaerotheca humuli*]. Resistance to wilt occurs in a few commercial varieties, such as Marshall, Sierra, and Blakemore, and in certain North American clones of *Fragaria chiloensis*. Seedlings of a South American form of the same species and of *F. virginiana*, ancestors of the garden strawberry, and those of the English varieties Royal Sovereign, Sir Joseph Paxton, King of the Earliest, and Waterloo, were susceptible.

ZENTMYER (G. A.). **A laboratory method for testing soil fungicides, with Phytophthora cinnamomi as test organism.**—*Phytopathology*, 45, 7, pp. 398–404, 1 fig., 1955.

From the University of California Citrus Experiment Station, Riverside, a method comprising two phases is reported for the assay of soil fungicides, chiefly using *Phytophthora cinnamomi* [*R.A.M.*, 34, p. 381], though *Verticillium albo-atrum* was included in some of the experiments. The chemicals, applied either as drenches or dry mixes, were tested in glass vials containing 2 in. autoclaved soil with an inoculum disk placed at a depth of 1 in. After a 24-hour incubation period at 25° C. the inoculum was recovered and cultured on agar (mostly maize meal) to determine viability.

Only 10 of the 47 compounds used as drenches penetrated 1 in. of soil in fungicidal concentration when applied to give a dosage of 500 p.p.m. The most effective

were Stauffer N-869 or vapam (sodium methyldithiocarbamate) and Stauffer N-521 (tetrahydro-3,5-dimethyl-2*H*-1,3,5-thiadiazine-2-thione), both of which were fungicidal to *P. cinnamomi* at 5 p.p.m. In the dry-mix series the best control was accomplished with actidione, new improved ceresan (ethylmercury phosphate), Stauffer N-869, and Stauffer N-521, which also destroyed the same organism at 5 p.p.m. In several instances *V. albo-atrum* proved much more refractory to chemical treatment than *P. cinnamomi*. Thus, dosages of 50 p.p.m. Stauffer N-869 and 500 p.p.m. actidione were required for the elimination of the former species, while a nabam drench, which was fungicidal to *P. cinnamomi* at 25 p.p.m., had to be used at 250 p.p.m. to produce a comparable effect on *V. albo-atrum*. Both species succumbed to pennsalt NP 1083 (1-fluoro-2,4-dinitrobenzene) at 250 and Rohm & Haas HD-160 (sodium 2-benzothiazolylmercapto acetate) at 2,500 p.p.m.

Attention is drawn to the marked differences observed in the toxicity of closely related compounds to *P. cinnamomi* in soil. For example, Stauffer N-869 was some 500 times more active than Rohm and Haas HE-1046 (sodium dimethyldithiocarbamate) or sodium diethyldithiocarbamate. Among the ethylenebisdithiocarbamates used in the drench test nabam was more than 100 times as fungicidal as zineb or maneb.

King (J. R.). **Effect of droplet size and the rate of application in controlling insects and diseases of row crops.**—*Diss. Abstr.*, 15, 7, pp. 1156–1157, 1955.

At Cornell University [Ithaca, New York], the effect of droplet size and rate of application on the distribution and deposition of spray materials [*R.A.M.*, 33, p. 741] and on the control of insects and plant diseases was investigated by means of an experimental, rotatable outlet, mist concentrate sprayer fitted with spring-loaded, poppet-type nozzles adjusted to give droplet sizes of 110 and 175 μ mass median diameter at application rates of 10 and 20 gals. per acre copper oxychloride sulphate. All four combinations gave satisfactory distribution and deposition but the 20 gal. rate and larger droplet size gave the best coverage and also the best control of onion blast (*Botrytis allii*) [32, p. 6; 34, p. 17].

McCallan (S. E. A.), Miller (L. P.), & Magill (Mary A.). **Chemical names for active ingredients of fungicides.**—*Phytopathology*, 45, 6, pp. 295–302, 1955.

In this useful alphabetical list of the chemical names for active ingredients of fungicides, prepared to assist authors of manuscripts for *Phytopathology* and others interested in the chemistry of fungicidal action, the system of nomenclature used by the American Chemical Society has been followed. In general, the compilation is limited to plant protectives of current interest, as indicated by reports during the five years from 1950 to 1954 in *Phytopathology*, *Plant Dis. Reptr*, and the Annual Results of Tests with Newer Fungicides published in *Agric. Chemic.*, with the addition of the fungicides more frequently mentioned in *Rev. appl. Mycol.* during the same period.

Williamson (C. E.). **Soil-borne disease, control with chemicals.**—*Down to Earth*, 10, 3, pp. 6–8, 2 figs., 1954.

In experiments at the Ornamentals Laboratory, Cornell University, Farmingdale, New York, methyl bromide and chloropicrin at 10 ml. per cu. ft., chlorobromopropene at 2·6 and 9·5 ml. per sq. ft., formaldehyde (1 in 50) at 2 qt. per sq. ft., and steam at 180° F. for 30 minutes were applied to greenhouse soil that had been (*a*) heavily infested with *Pythium* spp. [cf. *R.A.M.*, 33, p. 681] and *Rhizoctonia* sp. [loc. cit.]; (*b*) steamed and then inoculated with *R.* sp. from agar cultures; and (*c*) naturally infested with *Thielaviopsis basicola* [cf. 33, p. 722]. The other chemicals proved as effective as formaldehyde and steam in controlling the soil fungi, no infection appearing in cucumber or antirrhinum plants. Similarly, 1 lb. methyl

bromide to fumigate 55 gals. of sand used for propagating, effectively controlled black leg (*Pythium* spp.) on *Pelargonium hortorum* cuttings and also practically eliminated the pathogenic fungi and weed seeds in potting soil. Bromine-containing fumigants leave a residue, probably bromide, which is toxic to some plants even after nine months. Seeds of antirrhinum, carnation, and *Salvia* were sensitive, but many plants are not affected.

Miyahara (Y.). **On the fungicidal action of capillary active substances upon the conidia of Ophiobolus miyabeanus.**—*Ann. phytopath. Soc. Japan*, 18, 1–2, pp. 37–40. 1 graph. 1953. [Japanese, with English summary. Received 1955.]

The fungicidal activity of monobasic, saturated fatty acid, potassium soaps of 4 to 18 carbon atoms was tested against the conidia of *Ophiobolus miyabeanus* by soaking the conidia in the soap solution for four hours, washing in water, and leaving to germinate at 28° C. Activity increased with increasing number of carbon atoms up to a maximum at C_{10} and C_{12} and then diminished. An increase in the unsaturated double bonds in soaps with C_{18} enhanced the fungicidal activity slightly. Low activity was exhibited by naphthenic and abietic acid soaps and detergents, despite high capillarity. A soap containing cetyl-dimethyl-benzyl ammonium chloride possessed high capillarity and a strong fungicidal action in concentrations as low as 0·004 per cent.

Gottlieb (D.), Ammann (A.), & Carter (H. E.). **A new antifungal agent, filipin.**—*Plant Dis. Reptr*, 39, 3, p. 219, 1955. [Multilithed.]

A new anti-fungal metabolite, filipin, was obtained from an undescribed streptomycete at the Departments of Horticulture and Chemistry, University of Illinois, Urbana. The partially purified compound, probably a polyene, is a yellow solid, highly insoluble in water. Applied as a slurry to nine different kinds of seeds it was non-toxic, and at concentrations of 200 μg. per ml. alcohol solution did not retard the germination of peas or tomatoes in Petri dishes. Treated pea seeds were free from fungi on germination, while the untreated were invaded by species of *Aspergillus* and *Penicillium*, and by phycomycetes.

Grey leaf spot (*Stemphylium solani*) on artificially infected greenhouse tomatoes [*R.A.M.*, 34, p. 189] was reduced by 25 per cent. by spraying the young plants with an 830 p.p.m. preparation, and 50 p.p.m. prevented the germination of *S. solani* spores.

Brejcha (V.), Obenberger (J.), Starý (B.), & Šimek (A.). **Ochrana rostlin. Průvodce pro pracovníky v ochraně rostlin.** [Plant Protection. A guide for workers in plant protection.]—211 pp., 26 figs., 1 graph, State Agricultural Publishers, Prague, 1955. 23.20 Kčs.

This handbook on pests and diseases of cultivated plants in Czechoslovakia is divided into five parts: I (pp. 7–33) general problems in plant protection; II (pp. 34–91) descriptions of pests and diseases; III (pp. 92–161) chemicals and their application; IV (pp. 161–190) the technical side of plant protection, including illustrations of spraying equipment; and V the damage caused by and control of the pests and the 22 most important diseases.

Richtlinien für die Pflanzenschutzarbeit 1955 zusammengestellt auf Grund der Versuchsergebnisse der Bundesanstalt für Pflanzenschutz und der Beratungen der Pflanzenschutzkonferenz 1955. [Recommendations for plant protection work in 1955 compiled on the basis of the experimental results of the Federal Institute for Plant Protection and the discussions of the Plant Protection Conference 1955.]—*Pflanzenarzt*, 8. 2nd special issue, 13 pp., 4 figs., 1955.

A synopsis is presented of recommended measures for plant protection in Ger-

many, arranged according to host and parasite. Advice is also given concerning the prevention of detrimental effects of plant protectives on flavour, and measures for the protection of stored produce. Spray calendars are added for fruit crops.

Speciation and variation in asexual fungi.—*Ann. N.Y. Acad. Sci.*, 60, 1, pp. 1–182, 12 pl. (8 col.), 42 figs., 2 diags., 1954.

In the introduction to this symposium which he has edited K. B. Raper (pp. 3–5) outlines the problems involved, particularly those of taxonomy. Some inter-relationships of speciation, type preservation, and nomenclature in bacteria are discussed by R. E. Buchanan (pp. 6–15). He criticizes fermentation and serological criteria in classification, while admitting the necessity of using physiological characters. W. C. Snyder and H. N. Hansen (pp. 16–23) outline variation and speciation in the genus *Fusarium* [*R.A.M.*, 34, p. 402], concluding that although over 1,000 names have been proposed for this genus, only nine species and no varieties are justified on a morphological basis, but 40 formae speciales are recognized. It is also suggested that differences within some species, e.g. *F. oxysporum*, are comparable to horticultural varieties in higher plants, and the authors therefore suggest a new designation on these lines; thus *F. redolens*, considered to be such a variant, would be '*F. oxysporum* Redolens'. The development of species concepts in *Aspergillus* and *Penicillium* is reviewed by C. Thom (pp. 24–34). He outlines the characters used in diagnosis and describes the concept of the aggregate species. Spontaneous and induced variation in selected stocks of the *Penicillium chrysogenum* series are dealt with by J. F. Stauffer and M. P. Backus (pp. 35–49), and experimental control of morphogenesis in micro-organisms from a study of the physiology of yeast-like forms by W. J. Nickerson (pp. 50–57). Some of the information in D. M. Macleod's paper (pp. 58–70) on natural and cultural variation in entomogenous fungi imperfecti with special reference to *Beauveria* and *Tritirachium* has already been noticed [34, p. 325]. *Beauveria*, *Isaria*, and *Metarrhizium*, with simple nutritional requirements, are associated with a variety of insect species, while *Hirsutella* and *Spicaria* have more exacting nutritional requirements and a more limited host range. Types of variation in some actinomycetes [34, p. 615] (pp. 71–85) and variation in *Streptomyces aureofaciens* (pp. 86–101) are described by B. M. Duggar, E. J. Backus, and T. H. Campbell. Criteria of speciation in the genus *Streptomyces* [loc. cit.] are dealt with by P. R. Burkholder, S. H. Sun, J. Ehrlich, and Lucia Anderson (pp. 102–123). The genus is distinguished by the production of chains of spores on aerial hyphae, as distinct from *Actinomyces* where they are formed by the fragmentation of the mycelium. Useful criteria for speciation are examined in detail. *S.* [*A.*] *scabies* is able to utilize xylose, rhamnose, maltose, lactose, and cellobiose but not sucrose or raffinose, mannitol but not inositol, and tyrosine, glutamic acid, and tryptophane but not hydroxyproline or methionine. The medium of Pridham and Gottlieb [28, p. 190] with the addition of 1 per cent. soluble starch, 0·5 per cent. enzymatic digest of casein, and about 1·8 per cent. agar is recommended as one on which most species will grow and sporulate freely. The authors recommend the establishment of relatively few species groups, containing strains with specific features. Variation in *Streptomyces* is described by K. L. Jones (pp. 124–135) and useful criteria are supplied for species differentiation in the genus *Streptomyces* by C. W. Hesseltine, R. G. Benedict, and T. G. Pridham (pp. 136–151). In the latter paper is given a key which differentiates six major species groups by morphology and spore colour. Excellent correlation was obtained between microscopic characters, gross cultural features, and physiology. Alma Dietz (pp. 152–154) describes the uses of ektachrome transparencies as aids in actinomycete classification. Induced mutation and strain selection in some industrially important micro-organisms are dealt with by E. L. Dulaney (pp. 155–167). Morphological studies in the genus *Nocardia* [cf. 29,

p. 277], III, the morphology of young colonies, is contributed by N. M. McClung (pp. 168–181).

Harley (J. L.) & Waid (J. S.). **A method of studying active mycelia on living roots and other surfaces in the soil.**—*Trans. Brit. mycol. Soc.*, 38, 2, pp. 104–118, 1 diag., 3 graphs, 1955.

This method, which was applied successfully to the study of fungal populations on the surfaces of beech mycorrhiza, the roots of beech seedlings [*R.A.M.*, 34, p. 619], and the petioles of leaves in litter and on the plant, was devised in the Department of Botany, University of Oxford. It entails as many as 30 serial washings in 30 ml. screw-top phials with 5 or 10 ml. sterile distilled water to remove spores and other propagules, each washing being examined by the dilution plate technique. Fungus fragments capable of developing into mycelium are mostly displaced from the apices of beech mycorrhiza after the first few washes. After the 20th washing a low, fairly constant number of fragments was detected in each new aliquot. Material of low specific gravity must be transferred to a new phial after the first few washes owing to the considerable quantities of detritus that may settle.

The number of detachable fungus particles in the first washings of petiole surfaces of litter leaves exceeded that on living mycorrhiza from the same position in the soil by a factor of nearly 10 during the first three days of incubation. After a period of incubation the clean plant material developed an average of 4·3 types of mycelium per cm. of root fragment and 3 types per cm. of petiole fragment. The washing technique shows that the plating of unwashed surfaces gives a greatly over-represented population of sporing hyphomycetes while the reverse is true of phycomycetes and slow-growing, non-sporing mycelia.

The root systems of beech seedlings grown in fibre pots were freed from soil particles by shaking and washing and then cut into 5 cm. lengths and subjected to 20 serial washings, cut into 0·2 cm. segments and cultured at 25° C. for three days, and thereafter at room temperature. A diagram was then prepared of the distribution of mycelia on a single lateral beech root taken in October from a first-year seedling grown in garden soil. The numbers of species per cm. root increased from the apex backwards.

The following points emerge clearly from these studies: first the majority of fungi described in rhizosphere studies are derived from spores produced by mycelia in the soil, rhizosphere, and root surface areas; secondly when surfaces cleansed of spores are compared there is a marked contrast between the populations of living mycelia on roots and those on other soil surfaces; thirdly there are many slow-growing sterile mycelia and slow-sporing mycelia on living root systems which are not detected on unwashed root surfaces or in dilutions of washings from such surfaces. Modifications of the method have yielded interesting results in the study of the pattern arrangement of fungi on the surfaces of root systems of seedlings and upon the succession of fungi on the surfaces of grass roots in pastures.

Richards (M.). **A water-soluble filter for trapping airborne micro-organisms.**—*Nature, Lond.*, 176, 4481, pp. 559–560, 1955.

At the Asthma and Allergy Research Unit, St. David's Hospital, Cardiff, airborne micro-organisms [*R.A.M.*, 32, p. 392] were trapped in a cylindrical brass tube 75 mm. long, 12 mm. in diameter, and 11 mm. bore, having a sodium alginate wool plug supported by two crossed wires 25 mm. from one end, and the other end attached to a suction pump. Once the desired volume of air had been sucked through, the plug was dissolved in sterile water and aliquots of the solution were plated out on various media for incubation and identification and counting of the cultures. The alginate filter was particularly suited to work with selective media. Counts of non-culturable spores were obtained by microscopic examination of the

sediment remaining after an aliquot had been centrifuged. Used in conjunction with a small, hand-operated pump the filter provided a simple, efficient, and readily portable spore trap.

SHARP (E. L.). **Lyophilization and germ tube development of Puccinia uredospores.** —Abs. in *Iowa St. Coll. J. Sci.*, 28, 3, pp. 398–399, 1954.

This paper gives further details on lyophilization [*R.A.M.*, 32, p. 15], with reference also to the Barrat–Tatum technique [29, p. 575], and deals with the subsequent germination of spores so treated. It was shown that at least three factors in the medium were involved in vesicle formation, pH (6·2 to 6·6), zinc content (9 to 14 p.p.m.), and a 'gelatin factor', the last being extractable from gelatin by dialysis. Branching of germ-tubes occurred under the same general conditions as vesicle formation, but over a wider range of pH and zinc concentration. Zinc could not be replaced by other metals, nor the gelatin factor by a number of amino acids, growth factors, or nucleic acid derivatives tested; indications were obtained, however, that silicon might be the gelatin factor. At low concentrations it stimulated and at high suppressed vesicle formation and branching, and there appeared to be a complex interaction between zinc and silicon.

MILLER (P. M.). **V-8 juice agar as a general-purpose medium for fungi and bacteria.** —*Phytopathology*, 45, 8, pp. 461–462, 1955.

During the past three years at the Department of Horticulture, University of Illinois, and the Connecticut Agricultural Experiment Station, *Stemphylium solani* [the agent of grey leaf spot of tomato] sporulated profusely on V-8 juice agar [*R.A.M.*, 34, p. 680] without ultra-violet irradiation. In routine work the same medium has given very satisfactory results in the culture of *Alternaria solani*, *A. tenuis*, *S. sarciniforme*, *S. botryosum*, *Septoria lycopersici*, *Helminthosporium turcicum*, *Phytophthora infestans*, *Aspergillus niger*, *Penicillium oxalicum*, *Monilinia* [*Sclerotinia*] *fructicola*, *Glomerella cingulata*, *Colletotrichum phomoides*, *Botryosphaeria ribis*, *Pleospora herbarum*, *Physalospora obtusa*, *Erwinia amylovora*, *Xanthomonas campestris*, *Corynebacterium michiganense*, and a wide range of soil fungi. Not only does V-8 serve many purposes but it is inexpensive, sufficient juice for 1 l. agar costing less than 7 cents.

MARTIN (MARY) & GOTTLIEB (D.). **The production and role of antibiotics in soil. V. Antibacterial activity of five antibiotics in the presence of soil.**—*Phytopathology*, 45, 7, pp. 407–408, 1955.

In further studies in the current series at the Department of Horticulture, University of Illinois [*R.A.M.*, 32, p. 393], actinomycin was the only one of the antibiotics tested to inhibit the growth of *Bacillus subtilis* in the presence of soil, being completely effective at a concentration of 6 μgm. per gm. Circulin, neomycin, and viomycin were inactive against the same organism even at a strength of 500 μgm. per gm., nor did subtilin prevent the development of *B. cereus* in cultures when present in comparable amounts.

KATZ (MARGALITH). **Isolation of soil organisms antagonistic to some phytopathogenic fungi.**—*Palest. J. Bot.*, J. Ser., 6, 1, pp. 67–70b, 3 figs., 1953. [Hebrew summary.]

Studies were made in the Department of Botany, Hebrew University, Jerusalem, on the antibiotic effect of *Actinomyces diastaticus* and *Bacillus subtilis* [*R.A.M.*, 34, pp. 239, 665, 783 and next abstracts], isolated from soil, on the phytopathogenic fungi *Spondylocladium xylogenum* and *Alternaria* sp. (both from flax) and two strains of *Rhizoctonia* [*Corticium*] *solani*, one from flax and the other from potato. Tests on flax seeds infected with *C. solani* were carried out in sandy loam, inoculated with

the fungus on potato dextrose agar, suspensions of the antibiotic organism being either added to the substrate together with the seeds and the pathogen, or used as a steep for the seeds for 24 hours before sowing. In the former treatment *B. subtilis* increased survival of infected seedlings by 13 per cent., *A. diastaticus* being noticeably effective only as a pre-sowing treatment, which gave a 15 per cent. increase in survival.

Cercós (A. P.). **Fungocina, antibiótico sintetizado por Bacillus subtilis.** [Fungocin, an antibiotic synthesized by *Bacillus subtilis*.]—*An. Soc. cient. argent.*, 157, 4–6, pp. 38–46, 1954.

In further studies on the extraction, purification, and properties of fungocin, an antibiotic produced by *Bacillus subtilis* [*R.A.M.*, 34, p. 239 and preceding and next abstract], the substance combined with picric acid to produce a picrate which completely inhibited the growth of *Neurospora crassa* at 20 μgm. per ml. and had similar properties to the parent substance.

Morton (D. J.) & Stroube (W. H.). **Antagonistic and stimulatory effects of micro-organisms upon Sclerotium rolfsii.**—*Phytopathology*, 45, 8, pp. 417–420, 3 figs., 1955.

At the Louisiana Agricultural Experiment Station the antagonistic (and to a lesser extent the stimulatory) effects of miscellaneous soil organisms on *Sclerotium rolfsii*, the agent of southern blight [cf. *R.A.M.*, 12, p. 192; 28, p. 470; 33, p. 276], were investigated. In agar cultures two out of 1,114 bacteria (0·2 per cent.), 18 out of 1,064 actinomycetes (1·7), and 35 out of 1,005 fungi (3·5) inhibited the growth of the pathogen. The bacteria were identified as strains of *Bacillus subtilis* [see preceding abstracts], the actinomycetes as *Streptomyces* spp., and the fungi as *Trichoderma* spp. In greenhouse tests all three groups of organisms significantly reduced the severity of infection by *S. rolfsii* on Ogden soy-bean plants [33, p. 525] in sterilized sandy loam.

Thiamine has been shown to be essential for the growth of *S. rolfsii* on synthetic media, and it has been reported that several common species of bacteria produce this growth substance in relatively large quantities. In tests on Czapek's sucrose-nitrate agar without thiamine the fungus grew well in the presence of certain other micro-organisms, suggesting that the latter provide an essential metabolite, possibly thiamine. Of 1,036 bacteria, 842 (81·3 per cent.) stimulated development in this way, the corresponding figures for 1,005 actinomycetes and 1,219 fungi being 660 (65·7) and 826 (67·7), respectively. In the greenhouse, however, no significant increases in blight severity followed the use of stimulatory micro-organisms, e.g., *Pseudomonas mucidolans* and *Aerobacter aerogenes*, both of which promoted abundant growth of *S. rolfsii* on agar plates. Evidently, therefore, the soil microflora does not increase the spread of the pathogen under natural conditions.

Baker (Shirley D.). **Note on Tutsan rust in New Zealand.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 5, pp. 483–484, 1 fig., 1955.

Melampsora hypericorum, widespread in Europe, North Africa, Asia, and North America on several species of *Hypericum*, is reported to be causing severe rust on tutsan (*H. androsaemum*), a serious and continuously spreading pasture weed in New Zealand. The control of tutsan, particularly in the hill country, is difficult and the rust may partially eliminate it, but it is recognized that an eventual balance between host and parasite will probably be reached.

Cross (B. E.). **Gibberellic acid. Part I.**—*J. chem. Soc.*, [105], pp. 4670–4676, 1954.
Mulholland (T. P. C.) & Ward (G.). **Gibberellic acid. Part II. The structure and synthesis of gibberene.**—Ibid., pp. 4676–4681, 1954.

In further notes from the Butterwick Research Laboratories, Welwyn, Herts,

on the properties of gibberellic acid [*R.A.M.*, 34. p. 249], a metabolite of *Gibberella fujikuroi*, it is stated that this compound is a strong promoter of plant growth, inducing elongation of wheat and pea seedlings [cf. 34, p. 251].

The dehydrogenation of gibberellic acid with selenium yielded gibberene, which was shown to be 1:7-dimethylfluorine.

Morton (A. G.) & Broadbent (D.). **The formation of extra-cellular nitrogen compounds by fungi.**—*J. gen. Microbiol.*, 12, 2, pp. 248-258, 1 graph, 1955.

At the Butterwick Research Laboratories, Welwyn, Herts, the formation of extracellular nitrogen compounds by *Scopulariopsis brevicaulis*, *Aspergillus niger* [cf. *R.A.M.*, 33, p. 380], *Penicillium chrysogenum*, *Trichoderma viride*, and *Botrytis allii* in culture accompanied the primary assimilation of ammonia, nitrate, and inorganic nitrogen in a liquid medium under all the experimental conditions investigated. The amount of nitrogen produced by *S. brevicaulis* was affected markedly by the supply of iron, copper, zinc, manganese, and molybdenum: it was lowest when their concentration was high and increased as the concentration approached that limiting growth. Most of the extracellular nitrogen appeared to be peptide in nature, yielding about 14 amino acids on hydrolysis. The fungus was unable to assimilate the extracellular nitrogen compounds formed but assimilated the constituent amino acids when these were liberated by acid hydrolysis.

McKay (R.). **Degeneration in the Potato.**—*Sci. Hort.*, 11 (*1952–54*), pp. 104–117, 2 pl., 1955.

This article deals with potato viruses in the British Isles [cf. *R.A.M.*, 24, p. 244; 34, p. 537], namely, leaf roll and viruses X, A, X—A (crinkle), Y, X—Y (rugose mosaic), aucuba mosaic and its tuber blotch strain, interveinal mosaic (X+tuber blotch), paracrinkle, and witches' broom [33, p. 751]. Symptoms and varietal reaction are discussed and susceptible, tolerant, and intolerant varieties listed; some indications of control are given. Several of these viruses have been maintained in the glasshouse at the Albert Agricultural College, Glasnevin, Eire, for 30 years and all have remained remarkably stable.

Timian (R. G.), Hooker (W. J.), & Peterson (C. E.). **Immunity to virus X in Potato : studies of clonal lines.**—*Phytopathology*, 45, 6, pp. 313–319, 1 fig., 1 graph, 1955.

The studies herein reported from the Iowa Agricultural Experiment Station were undertaken to develop if possible a rapid and effective method for the identification of individuals immune from potato virus X [*R.A.M.*, 18, p. 544; 34, p. 806]. Susceptible clonal lines free from the virus were inoculated with seven isolates and the severity of the resultant symptoms was compared. Isolate X5, originating on B2900-27 in Maine, consistently incited both local and systemic symptoms in the progenies Iowa 940 (B 792-88 × Cherokee), Iowa 941 (B792-94 × Cherokee), and Iowa 943 (S 41956 × Cherokee). XRS from Wisconsin was also effective in the production of local lesions but less so in the causation of systemic symptoms. Less virulent isolates, especially X8 from the Green Mountain variety in North Dakota, which induced no symptoms on *Datura stramonium*, *Nicotiana glutinosa*, *N. rustica*, or tobacco, were relatively ineffectual for identification purposes.

All the experimental isolates produced typical local lesions on *Gomphrena globosa*, reacted positively in precipitin tests with XRS antiserum, and incited top necrosis in Epicure plants inoculated by grafting. Isolate X8 protected *D. stramonium* plants against more severe strains of the same virus. In general, the degree of pathogenicity of the several isolates was roughly comparable on potato and the other Solanaceae tested.

Mechanical inoculation proved to be more reliable and expeditious than the

graft method [16. p. 53] for the determination of resistance in 169 clonal lines. Immune plants tested by the former method developed no symptoms as a result of inoculation with any of the seven isolates and were further free from the virus when indexed on *G. globosa* plants. Susceptible individuals usually developed local and often systemic foliar necrosis. The more effective isolates tended to induce systemic necrosis rather than systemic mottling. Inoculated by the mechanical procedure, more plants in a number of clonal lines developed symptoms of systemic infection at 24° than at 16° C., whereas local lesions predominated at the lower temperature.

Timian (R. G.), Hooker (J. W.), & Peterson (C. E.). **Immunity to virus X in Potato : studies of segregating seedling populations.**—*Phytopathology*, 45. 8. pp. 445–450, 1 fig., 2 graphs, 1955.

In further trials in connexion with the potato improvement programme at the Iowa Agricultural Experiment Station the mechanical inoculation of seedlings with suitable isolates of potato virus X [see preceding abstract] proved to be a reliable method for the identification of susceptible segregates. Local and systemic symptoms developed at 16° C. within one and two weeks, respectively, in susceptible seedling transplants inoculated with the isolates already described [loc. cit.], all maintained in *Nicotiana glutinosa* plants under insect-proof cages. Immune seedlings contracted neither local necrosis nor systemic mottle as a result of inoculation, nor did they carry the virus systemically.

Information already presented concerning the relative pathogenicity of the several isolates is recapitulated. In tests with the two inducing the most severe symptoms, X5 and XRS (ring spot), local infection developed with equal intensity at 18° and 24°, whereas the higher temperature favoured the systemic form of the disease. At 10° the symptoms incited by X5 appeared more slowly than at either of the higher temperatures, and none of the plants inoculated with XRS became systemically infected.

In the greenhouse the reduction of light intensity by shading increased the incidence of infection by XRS from 67·5 to 74·7 per cent. at 16° and from 30·3 to 44·3 per cent. at 28°.

Crucq (J.) & De Lint (M. M.). **Het loofklappen en doodspuiten van Pootaardappelen.** [Beating down and chemical killing of seed Potato haulms.]—*Landbouwvoorlichting*, 12, 7, pp. 326–336, 5 figs., 1955.

During 1954 experiments were carried out in the principal seed potato-growing centres of Holland to determine the efficacy of mechanical and chemical haulm-killing as compared with pulling [*R.A.M.*, 34. p. 744]. The former method resulted in a lower incidence of brown rot [*Phytophthora infestans*] and an increase of *Rhizoctonia* [*Corticium*] *solani* [34. p. 315] in the tubers. Arsenite and undiluted oil, applied to the mechanically flattened crop, caused greater reductions of new growth than DNC in oil and a pre-emergence preparation. The Howard, Ratzekahl ZK 3, Steenbergen, and Schipper machines gave an efficient performance under unfavourable weather conditions.

Artem'ev (G. V.). Черная парша Картофеля и меры борьбы с нею. [Black scurf of Potato and its control.]—Сад и Огород [*Orchard & Garden*], *1955*, 1, pp. 44–47, 2 figs., 1955.

Potato black scurf (*Rhizoctonia* [*Corticium*] *solani*) [*R.A.M.*, 33. p. 753], widespread throughout the potato growing regions of the U.S.S.R., is reported to be greatly reduced by selecting clean seed pieces from summer plantings. Tubers with up to 0·5 per cent. infection (if this is not possible those with individual small sclerotia), immersed in wire baskets in a 0·5 per cent. formalin solution for five

minutes and left for two hours before planting, are recommended for Central Kazakhstan where the disease is particularly common. In an experiment at the Karagandinsk Agricultural Experiment Station a method was evolved of economically mass sterilizing the tubers arranged in layers 1 to 1·2 m. high in bins by pouring over the surface 0·4 per cent. formalin, using 25 to 30 l. of solution per ton of potatoes. The bins are then left for 12 hours at not less than +10° [C.] covered on all sides with tarpaulin thoroughly soaked in formalin. By this method the percentage of sclerotia killed was 83·1 (large) and 99·8 (small). When the bins were rinsed with pure water three days before treatment the kill was increased to 96·2 per cent. (large) and 99·9 per cent. (small). Storing for more than two or three days after formalin treatment reduces germination; increasing the formalin concentration above 0·5 per cent. adversely affects the yield. The previously recommended rates (1 in 20 and 2 in 100) are regarded as unnecessary and dangerous. Sprouting tubers should not be treated.

Logsdon (C. E.). **Studies on ring rot of Potatoes.**—*Diss. Abstr.*, 15, 3, p. 315, 1955.

In the course of studies on the potato ring rot organism (*Corynebacterium sepedonicum*) [*R.A.M.*, 30, p. 578] at the University of Minnesota, most of the bacteria in ooze from infected tubers died within four weeks on wood or burlap at either high or low humidities and at temperatures ranging from 23° to 70° F. Relatively few survived these conditions for as long as 117 days in sufficient numbers to infect seed pieces. When seed pieces were dipped in suspensions of 0·8 gm. bacterial ooze in 2 to 54 gals. water the most marked reduction in infection resulting from dilution occurred when the inoculum was taken from Red Warba or Green Mountain potatoes: with that from other varieties the reduction was only slight. Of the varieties studied, symptoms were least apparent on Teton and fewer infected plants of this variety produced tubers with visible symptoms at harvest. Soil temperatures of 19° to 28° C. seemed equally favourable to infection but at 16° there was a reduction in symptom intensity and the number of stems carrying bacteria; 31° or above seemed to inhibit symptoms and the movement of bacteria in the plant. Soil infestation with *Fusarium* spp. isolated from rotting potatoes suppressed the symptom intensity to some degree. Gram-positive bacteria very similar to *C. sepedonicum* were found in slightly frosted potato stems, which raises doubts as to the reliability of the Gram method in diagnosing ring rot.

Bonde (R.). **Antibiotic treatment of seed Potatoes in relation to seed-piece decay, blackleg, plant growth, and yield rate.**—*Plant Dis. Reptr.* 39, 2, pp. 120-123, 1 fig., 1955. [Multilithed.]

Field tests in Maine indicated that treatment of potato seed pieces three weeks before planting with agrimycin (streptomycin concentration 100 p.p.m.) checked decay and greatly reduced black leg (from 7·2 per cent. to a trace), both caused by *Erwinia atroseptica* [*R.A.M.*, 33, p. 444], an instant dip being as effective or more so than a 30-minute soak, which reduced emergence from 85 to 20 per cent. Treatment of cut seed potatoes in streptomycin nitrate invigorated the resulting plants, 50 p.p.m. being rather better than 100. The results need further confirmation.

Yoshii (H.). **On the influence of cephalothecin upon the nutritional absorption of ammonium nitrogen by the blast fungus.**—*Ann. phytopath. Soc. Japan*, 18, 1–2, pp. 9-13, 1 fig., 2 graphs, 1953. [Japanese, with English summary. Received 1955.]

In further cultural studies with the agent of rice blast [*Piricularia oryzae*: *R.A.M.*, 33, p. 559 and next abstract] the addition of cephalothecin inhibited the growth of the fungus and the absorption of ammonium ions from the culture solution, and it is suggested that there is a relationship between this and resistance to

blast of rice plants treated with cephalothecin. Rice plants infected by *P. oryzae* show a sharp decrease in ammonium content.

Yoshii (H.). **On the influence of cephalothecin upon the development of the blast fungus in the cells of the ear-neck of Rice plant.**—*Ann. phytopath. Soc. Japan*, 18. 1–2, pp. 17–21, 1 fig., 1953. [Japanese, with English summary. Received 1955.]

In further studies in this series [see preceding abstract] the development of *Piricularia oryzae* following inoculation was inhibited in basal tissue, previously soaked in cephalothecin, of the rachids of rice plants. From this and previous work it is concluded that the resistance of treated rice plants to *P. oryzae* is due to cephalothecin absorbed into the tissues.

Shen (T. H.) & Kung (P.). **Rice production and improvement in Taiwan.**—*News Lett. int. Rice Comm.*, 9, pp. 4–17, 1954.

In this review of rice production in Formosa it is stated that 15 per cent. of the crop was lost in 1952 through pests and diseases, of which one third was attributable to blast, *Piricularia oryzae* [*R.A.M.*, 34, p. 252]. The greatest damage occurs in the first crop of Ponlai varieties grown near hillsides and blast is aggravated by unbalanced fertilization. This and other diseases are controlled fairly effectively by seed treatment, recently with new improved granosan. Extensive breeding for resistance is in progress.

Akai (S.) & Yasumori (H.). **Studies on Helminthosporium blight of Rice plants. IX. Influence of azo-pigments upon the development of the causal fungus.** - *Ann. phytopath. Soc. Japan*, 18, 1–2, pp. 5–8, 1953. [Japanese, with English summary. Received 1955.]

In a further contribution to this series [*R.A.M.*, 33, p. 560] it is stated that the growth of *Cochliobolus* [*Ophiobolus*] *miyabeanus* in culture was inhibited by congo red and chrysoidin at $7{\cdot}5 \times 10^{-4}$ to 5×10^{-4} M solution. The former dye had no effect on conidial germination while the latter prevented it. Methyl orange and Bismarck brown had no effect on the mycelial growth of the pathogen.

Maruyama (M.). **Rice culture in Japan.**—*News Lett. int. Rice. Comm.*, 11, pp. 21–30, 1954.

The development of rice breeding in Japan is undertaken by seven National Regional and six Prefectural Agricultural Experiment Stations. There are 18 sites where tests are carried out for varietal reaction to various diseases, including blast [*Piricularia oryzae*: *R.A.M.*, 34, p. 252], bacterial leaf blight [*Xanthomonas oryzae*: 33, p. 113], brown spot [*Ophiobolus miyabeanus*: 34, p. 175], stem rot [*Leptosphaeria salvinii*: 33, p. 560], cold resistance [34, p. 105], and various pests. Other diseases of economic importance in Japan are sheath spot [*Corticium sasakii*: 33, p. 317] and downy mildew [*Sclerospora macrospora*: cf. 34, p. 396]. Sixty-four new rice varieties were developed in Japan between 1944 and 1953.

Park (D.). **Experimental studies on the ecology of fungi in soil.**—*Trans. Brit. mycol. Soc.*, 38, 2, pp. 130–142, 1 pl., 13 graphs, 1955.

In the Department of Cryptogamic Botany, University of Manchester, the ability of fungi native to a light garden loam of pH 6·4. viz., *Mucor silvaticus*, *Fusarium roseum* sensu Snyder & Hansen, *Cladosporium cladosporioides*, *Penicillium roqueforti*, *Trichoderma viride*, and *Monotospora daleae*, to exist saprophytically was compared with that of the alien species *Rhizopus sexualis*, *Aspergillus niger*, *Botrytis cinerea*, *P. digitatum*, *Trichothecium roseum*, and *Stemphylium sarciniforme*. Dishes of inoculated soil with a water-holding capacity varying from 43 to 60 per cent.

were kept on the bench at 15·8° to 21·3° C. and examined by a modified contact-slide technique. Leaves from vegetative shoots of *Dactylis glomerata* and internodal regions of clover stolons were added to the dishes.

The plant material was utilized in one of two ways. Either the fungus existed as a fertile mycelium restricted to the surface and not penetrating the substrate effectively or else the mycelium colonized deeply enabling the fungus to maintain itself more permanently. Only the native fungi colonized deeply and survived for more than six months, owing to their high degree of competitive saprophytic ability under conditions prevailing in soil.

Nose (H.). **On the saprophytic propagation of Hypochnus centrifugus in the soil.** — *Ann. phytopath. Soc. Japan.* 18, 1–2, pp. 14–16, 1 fig., 1953. [Japanese, with English summary. Received 1955.]

Evidence is presented from Japan that *Hypochnus centrifugus* [*Corticium centrifugum*: *R.A.M.*, 32, p. 326] is able to live saprophytically in soil in the rainy season during the absence of the host crops. Under experimental conditions growth was better in unsterilized soil than in sterilized soil; sclerotia were formed in agar media containing soil and plant fragments.

Bunt (A. C.). **Recent investigations into the use of steam for soil sterilisation.** — *Sci. Hort.*, 11 (*1952–54*), pp. 176–182, 4 graphs, 1955.

The information contained in this article is an abridged, combined version of two articles already noticed [*R.A.M.*, 33, p. 561; 34, p. 750].

Wallace (A.), North (C. P.), Mueller (R. T.), Shannon (L. M.), & Hemaidan (N.). **Behaviour of chelating agents in plants.** — *Proc. Amer. Soc. hort. Sci.*, 65, pp. 9–16, 1 fig., 1955.

In studies at the University of California, Los Angeles, it was found that the chelating agent, ethylenediamine tetra-acetic acid (EDTA) [*R.A.M.*, 34, p. 816], used for supplying micronutrients, was absorbed directly by the plants used, namely, avocado and sweet orange seedlings, sweet orange cuttings, and bush beans [*Phaseolus vulgaris*]. When sodium iron EDTA was added to the soil, the entire molecule was absorbed, the initial distribution of EDTA throughout the plant being essentially equivalent to that of the iron. EDTA was toxic but in different concentrations according to the plant species; the toxicity appeared to be caused by both the EDTA and the chelated iron. From 200 lb. to 400 lb. EDTA per acre were toxic to bean. At least some of the compound remained intact for some time after being absorbed. There was some evidence that chelating agents correct lime-induced chlorosis by facilitating iron intake and also effect iron translocation. Susceptible chlorotic plants in lime soil in the greenhouse having iron supplied with chelating agents grew almost as well as in soil not requiring additional iron. Sodium iron diethylenetriamine penta-acetic acid appeared to correct chlorosis more effectively than the other chelating agents studied. Treatments applied to chlorotic [unspecified] ornamental trees and shrubs in a calcareous soil were effective for only one season or year; those treated in late summer responded well.

Prevot (P.), Ollagnier (M.), Aubert (G.), & Brugière (J. M.). **Dégradation du sol et toxicité manganique.** [Soil exhaustion and manganese toxicity.] — *Oléagineux*, 10, 4, pp. 239–243, 1955.

Following seven successive crops of groundnuts from 1950 to 1953 on plots at the Agronomic Research Station, Lyon-Caen (Loudima), French Equatorial Africa, yields fell from 2,400 to 875 kg. pods per ha.: manganese content was high (over 600 p.p.m.) [see next abstract]. When the soil was left bare during two cropping

periods the manganese content was increased to 1,117 p.p.m. and the yield reduced to half that on an adjacent plot under continuous cultivation. In some sterile patches the manganese exceeded 5,000 p.p.m., with calcium and magnesium very low. The manganese content of groundnut leaves on an area in the Niari Valley, French Congo, where the soil was badly covered owing to failure of sunflower crops introduced in 1949, exceeded 1,000 p.p.m. and the yield was markedly reduced.

Recommended measures are the enrichment of the soil with organic matter (e.g., green manure), increase of soil pH by lime which decreases the absorption of manganese, particularly lime rich in magnesium, which can be found in the Niari. Sulphates should not be used because the increased acidity will make manganese more assimilable.

The studies established, in one case, a negative correlation between the manganese content and the potassium and magnesium contents.

Ollagnier (M.) & Prevot (P.). **Liaison entre dégradation du sol et toxicité manganique.** [Connexion between soil exhaustion and manganese toxicity.] — *Oléagineux*, 10, 10, pp. 663–666, 4 figs., 4 graphs, 1955.

Experiments with groundnuts, made between March and June, 1955, in the Niari Valley, French Congo [cf. preceding abstract], confirmed the existence of a correlation between soil exhaustion, low pH, and manganese toxicity. Additions of manganese sulphate to a rich soil produced the symptoms of manganese toxicity observed in an exhausted soil, while magnesium limestone (2 tons per ha.) at sowing reduced these symptoms in large-scale cultivation and eliminated them in pot cultures; manganese absorption was considerably reduced. Investigations regarding the timing of lime applications, residual effects, and the influence of organic matter are in progress.

Cook (A. A.). **Charcoal rot of Castor Bean in the United States.** *Plant Dis. Reptr*, 39, 3, pp. 233–235, 1 fig., 1 graph, 1955. [Multilithed.]

Charcoal rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*] was recorded on castor bean (*Ricinus communis*) [cf. *R.A.M.*, 33, p. 451] for the first time in the United States in 1954 at College Station, Texas, Blackville, South Carolina, Warsaw, Virginia, Beltsville, Maryland, and Gainesville, Florida. There are no pronounced external symptoms, but the disease may cause blackening of the stem at or about ground level followed by early maturity and death of the plant. Sclerotia are usually abundant under the epidermis and in the pith. In needle inoculation experiments Tender Green Pod bean [*Phaseolus vulgaris*] and sesame were susceptible to the castor isolate [28, p. 84].

Matuo (T.). **On a new leaf disease of Ricinus communis L. caused by Mycosphaerella ricinicola (Speg.) Hemmi et Matuo.** *Res. Rep. Fac. Text. Seric. Shinshu Univ.*, 3, pp. 7–10, 2 figs., 1953. [Japanese, with English summary.]

A leaf disease of *Ricinus communis* in Japan, similar to that caused by *Phyllosticta ricini* [cf. *R.A.M.*, 28, p. 592], is ascribed to a species of *Mycosphaerella*. Brown spots appear on both sides of the leaves, in the centre of which both pycnidia and perithecia are present. The spots differ in size and are more irregular than those of *P. ricini*, and the optimum temperature for growth of the causal fungus is 26° C., slightly higher than that of the former (24° to 26°). On the basis of similarity in the ascigerous stage, the writers rename the fungus *Mycosphaerella ricinicola* n.comb. (syn. *Sphaerella ricinicola*).

Maistre (J.). **Le Giroflier à Madagascar et Zanzibar.** [The Clove tree in Madagascar and Zanzibar.] *Agron. trop., Nogent*, 10, 4, pp. 413–448, 7 figs., 8 graphs, 1 map, 1955. [English and Spanish summaries.]

The identity of 'apoplexy' on clove trees in Madagascar [*R.A.M.*, 16, p. 340]

with the 'sudden death' disease due to *Valsa* [*eugeniae*] occurring in Zanzibar [34, p. 137] has yet to be established; it causes only insignificant damage to individual trees in otherwise healthy plantations. Another commercially unimportant disease is die-back, a slower decline [cf. 28, p. 420], due probably to poor soils and sub-soils, whose main symptom is foliage wilt starting from the top of the tree. The other fungus diseases [cf. 16, p. 340] listed include an *Aschersonia* sp.

Joshi (N. C.). **Notes on two diseases of Cumin cyminum L. hitherto unreported from Ajmer State.**—*Sci. & Cult.*, 21, 2, pp. 101–102, 1955.

Two diseases of cumin, new to Ajmer State, India, are described. *Alternaria* blight (*A. burnsii*) [*R.A.M.*, 30, p. 627], first observed in February and March, 1955, and causing serious losses in areas where it was severe, was checked by spraying with Bordeaux mixture at the first appearance of the disease. Powdery mildew (*Erysiphe polygoni*) [loc. cit.], first noticed in February and March, 1953, was completely controlled by perenox, applied at the onset of the outbreak.

Ettig (B.). **Über wechselseitige antibiotische Wirkungen zwischen Helminthosporium papaveris Saw. und Bodenbakterien.** [On the reciprocal antibiotic effects between *Helminthosporium papaveris* Saw. and soil bacteria.]—*Zbl. Bakt.*, Abt. 2, 108, 19–20, pp. 530–535, 8 figs., 1955.

Of 90 strains of bacteria isolated from samples of soil from a field under opium poppies at the Biological Central Institute, Naumburg, Germany, 11 (10 per cent.) more or less actively inhibited the growth of *Helminthosporium papaveris* [*Pleospora papaveracea*: *R.A.M.*, 34, p. 320] in streak tests on a medium of poppy seed decoction with 0·5 per cent. malt agar. All were Gram-positive and formed spores. In these tests the bacteria were allowed to develop for a fixed period before contact with the fungus was established. In another series, in which both partners were streaked on the plates simultaneously, separated by a distance of 20 mm., *P. papaveracea* likewise exerted a powerful inhibitory action on the majority of its antagonists.

Malaguti (G.) & Rodríguez (A. V.). **La pudrición de los esquejes de la Caña de Azúcar y posibilidad de su control con fungicidas.** [Rot of Sugar-Cane cuttings and the possibility of controlling it by means of fungicides.] *Agron. trop., Maracay*, 4, 2, pp. 61–67, 1954. [English summary. Received 1955.]

Commercial sugar-cane in Venezuela is affected by pineapple disease (*Ceratostomella* [*Ceratocystis*] *paradoxa*) [*R.A.M.*, 33, p. 281], particularly during January and February. Following the inoculation of cuttings at the Centre for Agronomical Investigations, Maracay, the percentage reductions in germination were: P.O.J. 2878, 24·7; P.O.J. 2961, 59·45; B. 37161, 22·08; B. 41227, 55·65; and B. 4362, 73·44. The most effective disinfectants [34, p. 676] were 0·25 per cent. granosan M., 1 per cent. semesan bel, copper A compound, phygon XL, fermate, zerlate, and 0·5 per cent. dithane Z-78.

Orian (G.). **Fiji disease of Sugar Cane in Madagascar.**—*Rev. agric. Maurice*, 33, 5, pp. 219–225, 2 pl., 1954. [Received 1955.]

The information contained in this report on the occurrence of Fiji virus disease of sugar-cane in Madagascar [*R.A.M.*, 34, p. 321], with recommendations for the prevention of its introduction into Mauritius, has already been noticed from another source [34, p. 107].

Bruehl (G. W.). **Evidence indicating presence of the ratoon stunting virus disease of Sugar-cane in Puerto Rico.** –*Plant Dis. Reptr*, 39, 2, pp. 157–158, 1955. [Multilithed.]

Trials conducted in 1953 by the Field Crops Research Branch, United States

Department of Agriculture, and the Insular Experiment Station, Rio Piedras, Puerto Rico, indicate that the ratoon stunting virus is present on sugar-cane [cf. *R.A.M.*, 34, p. 818] in Puerto Rico.

Joshi (N. C.). **Effect of hot water treatment of setts for the control of red rot and smut disease of Sugar-cane.**—Reprinted from *Indian Sug.*, [N.S., 4], 2 pp., 1954.

Treatment of sugar-cane setts with hot water at 52° C. for 18 minutes gave the best control of red rot [*Glomerella tucumanensis*] and smut [*Ustilago scitaminea*: *R.A.M.*, 34, p. 547] in the susceptible variety Co. 213 without damaging the buds. Resistance as well as yield was increased by the treatment.

The principles of microbial classification. A report of the discussion meeting of the Society for General Microbiology, September, 1954.—*J. gen. Microbiol.*, 12, 2, pp. 314–386, 1955.

The papers read at the above meeting were as follows: Introduction, the philosophy of classification, by S. T. Cowan (pp. 314–319) with a discussion by J. W. Howie and G. S. Wilson; Nomenclature, the handmaid of classification, by G. C. Ainsworth [*R.A.M.*, 33, p. 759] (pp. 322–323); General morphology, by T. Gibson (p. 324); The value of cytological studies in elucidating natural relationships among bacteria, by K. A. Bisset (pp. 325–329); The impact of genetics, by G. Pontecorvo (pp. 330–331); Considerations of general physiology, by S. R. Elsden (pp. 332–336); Methods for determining the biochemical activities of micro-organisms as applied to classification, by Patricia H. Clarke [32, p. 68] (pp. 337–343); Bacterial toxins and classification, by C. L. Oakley (pp. 344–347) with a brief comment by A. Felix; Nutritional characters, by B. C. J. G. Knight (pp. 348–351); Host-parasite relationships, by G. C. Ainsworth (pp. 352–355); The classification of viruses, by F. O. Holmes (pp. 356–357), C. H. Andrewes (pp. 358–361), and F. C. Bawden (pp. 362–365) with a discussion by A. Felix; The use of serology in the classification of micro-organisms, by P. M. Frances Shattock (pp. 367–372) with discussions by M. Elizabeth Sharpe, Joan Taylor, and Ruth Charter; Bacteriophage and bacterial classification, by B. A. D. Stocker (pp. 375–379) with discussions by E. S. Anderson and A. Felix; and finally a summing-up by N. W. Pirie (pp. 382–386).

Palti (J.) & Nitzany (F.). **Synopsis of rusts and downy and powdery mildews of leguminous crops in Israel.**—*Plant Dis. Reptr*, 39, 3, pp. 277–279, 1955. [Multilithed.]

This synopsis, tabulated under the hosts, of rusts and powdery and downy mildews of legumes in Israel, their regional and seasonal distribution and economic importance, is compiled with reference to the publications of Rayss [*R.A.M.*, 26, p. 130; 28, p. 247] and Reichert [19, pp. 73, 134] and contains data collected by the Division of Plant Pathology, Agricultural Research Station, Rehovot.

Sprague (R.). **Check list of the fungi of the Glacier Bay National Monument, Alaska.**—*Res. Stud. St. Coll. Wash.*, 23, 3, pp. 202–224, 1955.

This list [cf. *R.A.M.*, 34, p. 789] was compiled from 542 specimens collected in Alaska, mostly in 1952. Some records have already appeared in previous publications [loc. cit.; 33, pp. 183, 607]. The following are of special interest: *Clariceps purpurea* [C.M.I. map No. 10], which is widely distributed, was found on *Agropyron trachycaulum* and *Elymus mollis*, *Ophiobolus graminis* [cf. *R.A.M.*, 31, p. 548] on *A. trachycaulum*, *Uromyces fabae* [C.M.I. map No. 200] on *Lathyrus maritimus*, *Exobasidium vaccinii* on *Cassiope* sp., *Menziesia ferruginea*, and *Vaccinium ovalifolium*, *Septoria avenae* [*Leptosphaeria avenaria*: *R.A.M.*, 33, p. 607] on *Agrostis exarata*, *S. nodorum* [C.M.I. map No. 283] and *Helminthosporium teres* on *Hordeum brachy-*

antherum, and *Colletotrichum graminicola* [cf. *R.A.M.*, 33, p. 637] on *Elymus mollis* and *Poa stenantha*.

Spiltoir (C. F.) & Olive (L. S.). **A reclassification of the genus Pericystis Betts.**—*Mycologia*, 47, 2, pp. 238–244, 2 figs., 1955.

Studies at Columbia University, New York, on *Pericystis apis* [*R.A.M.*, 15, p. 217: 31, pp. 256, 488] showed that the genus has been erroneously classified by most authors among the Hemiascomycetes. It was erected in 1912 to accommodate *P. alvei* [9, p. 524], reported to be common in England on pollen in beehives. In 1916 A. Maassen named *P. apis* as the causal organism of 'chalk brood' of bees in Central Europe. Owing to similarities of *Pericystis* to *Monascus* in the early stages of sexual reproduction and also in view of the ascogenous system of croziers and asci produced by *P. apis*, the genus should be placed in the Plectascales, though not in any existing family in that Order.

As *Pericystis* Betts is predated by *Pericystis* Agardh (*Öfv. K. Vet.-Akad. Forh.* 4, [p.] 6, (1847), 1848), a validly published name for a genus of algae, it may no longer be accepted for a genus of fungi. The authors accordingly propose *Ascosphaera* n.gen., with a full description, for *Pericystis* Betts. *A. apis* (Maassen ex Claussen) n.comb. [see next abstract] is designated as the type species. Descriptions are also given of Ascosphaeraceae fam. nov., *A. apis* var. *apis* (type var.), and *A. apis* var. *major* (syn. *P. a.* var. *major* Prokschl & Zobl) n.var., all composite descriptions based on various publications and on the authors' own observations. A description is also given of *A. alvei* n.comb. based on the original one by Betts.

Spiltoir (C. F.). **Life cycle of Ascosphaera apis (Pericystis apis).** *Amer. J. Bot.*, 42, 6, pp. 501–508, 75 figs., 1955.

A detailed description is given of the life-cycle of the bee parasite *Ascosphaera apis* [see preceding abstract]. The fungus is morphologically heterothallic (sexually dimorphic), having ascogonia with trichogynes, nutriocyte, and a stalk-like portion, but no antheridia. It is thought that each ascus contains eight spores, the mature asci being grouped into balls. The taxonomy of the Ascosphaeraceae as a family within the Eurotiales is discussed.

Purdy (L. H.). **A broader concept of the species Sclerotinia sclerotiorum based on variability.**—*Phytopathology*, 45, 8, pp. 421–427, 1 fig., 1955.

Inconsistencies in the taxonomic status of *Sclerotinia sclerotiorum*, *S. trifoliorum*, and *S. minor* prompted the author's comparative study at the Department of Plant Pathology, University of California, Davis, on monoascospore cultures of species from the standpoint of modern concepts of specialization, based on a knowledge of variation [see above, p. 33].

It was found to be impracticable, if not impossible, to distinguish the three species on the grounds of ascus and ascospore measurements. Cultural variants developing on potato dextrose agar ranged from those producing no sclerotia to those forming large sclerotium-like masses. A continuous intergradation in sclerotial dimensions was obtained from those of *S. minor* (0·5 to 4 by 0·5 to 2 mm.) and *S. intermedia* [*R.A.M.*, 4, p. 12] to the large-sized *S. trifoliorum* (2 to 10 by 2 to 5 mm.) and *S. sclerotiorum*: the last-named fell into three cultural types with sclerotia measuring 3 to 10 by 3 to 7, 2 to 7 by 2 to 4, and 4 to 25 by 3 to 11 mm., respectively. Sclerotial size, therefore, afforded no reliable basis for specific separation.

Also included in the investigations were *S. trifoliorum* var. *fabae* [31, p. 187] and *S. sativa* [23, p. 108], and it is concluded that they and the three above-mentioned comprise a natural group producing apothecia and true sclerotia, lacking conidia, and attacking a wide range of plants. Since the variability of the taxonomic characters that have been used to describe these species precludes their identifica

tion in practice, it is proposed that the name *S. sclerotiorum* be applied to all five, together with *S. t.* var. *fabae*, irrespective of their hosts. For practical convenience, the former species *S. intermedia* and *S. minor* may be considered as 'horticultural varieties' of *S. sclerotiorum* and designated '*S.s. Intermedia*' and '*S.s. Minor*', respectively, while the forms with large sclerotia may be termed '*S.s. Major*'.

A list of proposed synonyms of *S. sclerotiorum* and an emended description of the species [in English only] are given.

Lowe (J. L.). **Perennial polypores of North America. III. Fomes with context white to rose.**—*Mycologia*, 47, 2, pp. 213–224, 1955.

In this final contribution to the present series [cf. *R.A.M.*, 34, p. 185] the author gives descriptive notes on and a key to the North American species of *Fomes* with a pale context retained in the genus by Murrill. Of the 53 species listed, 22 are recognized as valid. Of the species that are widespread, mention may be made of *F. annosus* (syn. *Polyporus irregularis*), *F. connatus* (syn. *F. populinus*), *F. fraxineus* (syn. *P. induratus*), and *F. pinicola* (syn. *F. ungulatus*, *P. marginatus*, and *P. ponderosus*). Three new combinations are made: *F. feei* (syn. *Polyporus feei* Fr.), *F. nobilissimus* (syn. *Oxyporus nobillissimus* W. B. Cooke), and *F. unita* (syn. *Polyporus unitus* Pers.). Additions and corrections to the earlier lists [loc. cit.] are given in a supplement.

Matters (G. Nan), Da Costa (E. W. B.) & Tamblyn (N.). **Morphological characters of Polyporus australiensis Wakefield, P. colensoi Berk., P. tumulosus Cke., and Schizophyllum commune Fr.** –*Progr. Rep. CSIRO For. Prod. Div. Proj. P. 11. Sub-Proj. P. 11-12*, 3, 18 pp., 3 pl., 1 fig., 5 diags., 1953. [Mimeographed.]

In this contribution [cf. *R.A.M.*, 33, p. 185 and next abstract] to the identification of basidiomycetes a detailed description is given of the morphological characters of *Polyporus australiensis*, *P. colensoi*, *P. tumulosus*, and *Schizophyllum commune*, following methods already described [loc. cit.]. The microscopic features, such as branching, hyphal characters, clamp-connexions, type of chlamydospore, crystals and oidia, were recorded on mark-off charts, carrying diagrams of the characters most useful in identification. The occurrence and frequency of these characters is then noted for each fungus by the use of appropriate symbols.

Luttrell (E. S.). **Helminthosporium flagelloideum.**—*Mycologia*, 47, 2, pp. 268–270, 1 fig., 1955.

As the result of an examination of the type collection of *Helminthosporium flagelloideum* [*R.A.M.*, 6, p. 754] the species is renamed *Alternaria flagelloideum* (Atk.) n.comb.

Hesseltine (C. W.) & Fennell (Dorothy I.). **The genus Circinella.**—*Mycologia*, 47, 2, pp. 193–212, 2 figs., 1955.

A taxonomic study of the genus *Circinella* [*R.A.M.*, 14, p. 655] is presented, with a key for the identification of the eight recognized species, including *C. linderi* n.sp.: *C. tenella* and *C. glomerata* are excluded. The zygospores of *C. muscae* and *C. umbellata* are described and figured. A list of 36 references is appended.

Ruizhkov (V. L.) & Loidina (Mme G. I.). О размножении вируса мозаичной болезни Табака в изолированных листьях Табачного растения. [Concerning the multiplication of the virus of the mosaic disease of Tobacco in isolated leaves of the Tobacco plant.]—Докл. Акад. Наук СССР [*C.R. Acad. Sci. U.R.S.S.*], 99, 3, pp. 459–462, 3 graphs, 1954. [Received October, 1955.]

In experiments at the Institute of Microbiology, U.S.S.R. Academy of Sciences [Moscow], the minimum time required for a significant amount of tobacco mosaic virus [*R.A.M.*, 34, pp. 617, 754 and next abstract], determined from the number

of lesions induced on *Nicotiana glutinosa* leaves, to appear in detached tobacco leaves infected with the virus and floated in water was 48 hours after inoculation. In one experiment virus did not appear even after 126 hours. When leaves were kept in the light the virus titre was somewhat higher than in the dark, but light did not reduce the latent period. Leaving inoculated leaves on the plant did not affect the tempo of multiplication.

Another experiment confirmed a previous suggestion that the virus cannot penetrate mature plastids.

Gondo (M.). **Effect of plant hormones on Tobacco mosaic symptoms. I.**—*Ann. phytopath. Soc. Japan*, 18, 1-2, pp. 22-24. 1953. [Japanese, with English summary. Received 1955.]

Halves of detached leaves of *Nicotiana glutinosa* inoculated [? at Kagoshima University, Japan] with tobacco mosaic virus and treated with 2,4-D and α-naphthalene acetic acid [*R.A.M.*, 32, p. 515] alone or together in agar or in viruliferous sap formed fewer necrotic spots than the untreated halves. It is concluded that the hormones affect the susceptibility of the host plant rather than the activity of the virus.

Sasser (J. N.), Lucas (G. B.), & Powers (H. R.). **The relationship of root-knot nematodes to black-shank resistance in Tobacco.**—*Phytopathology*, 45, 8, pp. 459–461, 1 fig., 2 graphs, 1955.

In greenhouse tests at the North Carolina Agricultural Experiment Station, tobacco seedlings of the Dixie Bright 101 and Dixie Bright 102 varieties, moderately and highly resistant, respectively, to black shank (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, 34, p. 823] were grown in steamed soil inoculated with the fungus either alone or in combination with root-knot nematodes (*Meloidogyne* spp.). Black shank developed earlier and more severely in plants exposed to contact with both pathogens than in those attacked only by the fungus. The function of the nematodes in breaking down the resistance of the host to *P. p.* var. *nicotianae* appears to involve other factors besides mechanical injury, possibly a modification of the biochemistry of the cells in such a way as to enhance their congeniality to the fungus. In any case, control of the nematode either by soil fumigation or crop rotation should be practised in fields invaded by black shank pending the development of root knot-resistant varieties.

Moore (E. L.), Todd (F. A.), & Clayton (E. E.). **Resistant Tobacco today and tomorrow.**—*Res. & Fmg N.C.*, 11, pp. 6-7, 2 figs., 1953. [Received 1955.]

This progress report on breeding tobacco for resistance to black shank [*Phytophthora parasitica* var. *nicotianae*] is presented on popular lines. The best resistant varieties and lines tested in 1952 included 8259 B (18·7 per cent. dead or diseased plants in August), 0504 (20·0 per cent.), and Dixie Bright 102 [*R.A.M.*, 32, p. 216, and preceding abstract] (32·2 per cent.). Superior black shank resistance, yield, and quality were shown by 2041 in the F_4 generation from a Hicks cross. This line averaged 4 and 23 per cent. diseased plants in two localities, compared with Dixie Bright 101 with 15 per cent. An F_3 selection, 2076, from a cross of Dixie Bright 28 and Dixie Bright 102, had 13 and 26 per cent. infection in two localities, while Dixie Bright 102 had 24 and 42.

The resistant Burley varieties, Greenville 41 and 42, were more resistant to *P. parasitica* var. *nicotianae* than Dixie Bright 102.

Govinda Rao (P.) & Koteswara Rao (D.). **Occurrence of Phytophthora parasitica var. nicotianae on Tobacco in Bapatla (Andhra).**—*Sci. & Cult.*, 21, 1, p. 39, 1955.

Phytophthora parasitica var. *nicotianae* is reported to have been responsible for

an epiphytotic of leaf blight of seedling tobacco in Bapatla, India [*R.A.M.*, 15, p. 777], in 1954. The fungus, which was isolated in pure culture, has not been previously reported causing leaf blight with brown spotting in India.

Person (L. H.) & Garriss (H. R.). **Widespread and severe outbreak of Tobacco blue mold in the field in 1954.**—*Plant Dis. Reptr*, 39, 3, pp. 228-230, 2 figs., 1955. [Multilithed.]

During the 1954 season the field incidence of tobacco blue mould (*Peronospora tabacina*) [see next abstract] was the highest on record throughout the flue-cured tobacco growing areas of the United States. In North Carolina losses of the first primings and, in some fields, the second and third amounted to some $5,000,000.

Valleau (W. D.). **Tobacco blue mold control through plant bed management.**—*Plant Dis. Reptr*, 39, 3, pp. 231–232, 1955. [Multilithed.]

The following programme is recommended for the control of tobacco blue mould (*Peronospora tabacina*) [*R.A.M.*, 34, p. 754 and preceding abstract] in southern Georgia and areas farther north: prevention of the overwintering of suckers from the field crop; use of a permanent plant bed site sown with a summer cover crop soon after setting is completed, the cover crop to be ploughed under in the autumn; and disking of any old bed that is not to be used again, or otherwise destroying the plants, to avoid seeding and the production of volunteer plants on which the fungus can overwinter.

Wolf (F. T.). **Nutrition and metabolism of the Tobacco wilt Fusarium.**—*Bull. Torrey bot. Cl.*, 82, 5, pp. 343–354, 1955.

At Vanderbilt University, Nashville, Tennessee, the tobacco wilt pathogen, *Fusarium oxysporum* var. *nicotianae* [*R.A.M.*, 33, p. 119] utilized a wide variety of carbon sources and also nitrate, ammonium, and amino nitrogen. Growth on aspartic and glutamic acid and β-alanine was far superior to that on inorganic nitrogen sources. The fungus grew in a yeast-like form in shake cultures. Ethyl alcohol was a major metabolic product of glucose fermentation. A red, water-soluble pigment identified as rubrofusarin and having the properties of an indicator was produced in culture filtrates.

Cole (J. S.). **Tobacco anthracnose.**—*Rhod. Tobacco*, 9, pp. 4–5, 2 figs., 1955.

The occurrence of tobacco anthracnose (*Colletotrichum tabacum*) [*R.A.M.*, 34, p. 707] in Southern Rhodesia is reported. The first case was seen in the Nyabira district in 1953. Control with zineb [loc. cit.] is recommended.

Hill (A. V.) & Mandryk (M.). **A study of the virus diseases 'big bud' of Tomato and 'yellow dwarf' of Tobacco.**—*Aust. J. agric. Res.*, 5, 4, pp. 617–625, 1954.

The virus diseases yellow dwarf of tobacco [*R.A.M.*, 33, p. 764] and big bud of tomato [33, p. 621] are of considerable economic importance in Australia. Yellow dwarf virus affects newly transplanted tobacco, particularly in Victoria, and may cause heavy losses, especially in dry seasons. Big bud virus occurs in tomato, potato, and lucerne in New South Wales and in lucerne in northern Australia. In the field in southern Australia big bud occurs six to eight weeks later than yellow dwarf and relatively few plants become infected.

In transmission experiments at the Division of Plant Industry, Canberra, Australia, six big-bud scions from tomato were grafted each month for a year to tomato and 20 of the 24 plants so treated during September–December developed symptoms, some after only 20 days, though only 17 of the remaining 48 did so. Contemporaneous grafts with yellow-dwarf scions from tomato, however, gave a high proportion of 'takes' throughout the year.

Fifteen Factor [Up-to-Date] potato plants grafted with scions from big bud tomato remained healthy, but from an abnormal scion from one tuber from these typical big bud was transmitted to tomato. In another experiment ten Katahdin potato plants were grafted with scions from big bud tomato and ten with big bud from potato after multiplication on tomato. Two of the latter group developed symptoms but produced no tubers, whereas all the others produced two to five healthy tubers. Scions from potato plants affected in the field when grafted on to tomato and *Datura stramonium* produced typical symptoms of big bud.

When three commercial varieties of tobacco and 12 other species of *Nicotiana* were grafted with yellow-dwarf scions, all the tobacco varieties proved to be susceptible. Of the five species of *N.* that remained apparently healthy, *N. glauca* was eventually found to be a symptomless carrier.

Yellow dwarf scions from tomatoes were grafted to three plants each of 11 varieties of tomato. Symptoms were most marked in Dwarf Champion and Golden Queen. No symptoms were shown by South Australian Dwarf Red. After transplanting, Marglobe, Burwood Prize, and Woodward Sensation developed and retained the most obvious symptoms, other varieties appearing only slightly affected.

When both viruses were transferred by grafting to the same tomato or tobacco plants, big bud symptoms were dominant. In tobacco plants naturally infected in the field by both viruses total growth appeared to be determined by yellow dwarf, whereas proliferation was due to big bud, each virus continuing to cause specific effects on growth.

The big bud virus was transmitted by dodder (*Cuscuta campestris*) from tobacco to tobacco, tomato, *N. glutinosa*, *N. rustica*, beet, and *Vinca rosea*, though yellow dwarf virus could not be so transmitted.

Yellow dwarf virus was not transmitted by *C. campestris* from tobacco to lucerne, carrot, or *N. gossei*, nor from *Datura* to tobacco. Further tests with eight other species of dodder were negative, and sap inoculations of yellow dwarf virus from tobacco to tobacco and *Datura* also failed.

It is concluded that tomato big bud and tobacco yellow dwarf are caused by different viruses having the same insect vector (*Orosius argentatus*), the same distribution in Australia, and the same general host range, but differing in host plant reactions. In some plants, such as tomato and *Datura*, early symptoms in young leaves are similar, but are soon replaced by proliferation and greening of floral parts in big bud and by stunting and yellowing in yellow dwarf. Cell differentiation is abnormal in big bud but unaffected in yellow dwarf, though total growth is greatly reduced by the latter. These characteristic symptoms do not, however, occur on all infected species, so that it is often necessary to check for the viruses by transfer to tomato and tobacco. The evidence indicates that the host range is determined almost entirely by the insect vector, the diseases assuming importance when plants not normally favoured by it, such as tobacco, tomato, lucerne, and potato, become infested after those on which the insect breeds have died, and so caused migration.

Macneill (B. M.). **Some viruses of the field Tomato in Ontario.** -*Plant Dis. Reptr*, 39, 3, pp. 191–193, 1955. [Multilithed.]

A survey, sponsored by the Research Council of Ontario, Canada, of mechanically transmitted viruses in field tomatoes was carried out during 1952 and 1953 on some 200 samples from canning crop areas mainly in the counties of Prince Edward, Northumberland, Essex, and Kent. Data based on the reactions of differential hosts, thermal inactivation tests, and cross-protection and serological reactions indicated the occurrence of tobacco mosaic, *Lycopersicum* virus 1 (a strain of tobacco mosaic causing streak symptoms on tomato), [tobacco] etch [*R.A.M.*, 34, p. 753],

tomato spotted wilt, and combinations of tobacco mosaic with potato virus X or with tobacco etch and potato virus Y, both causing streak.

Kahn (R. P.), Desjardins (P. R.), & Senseney (C. A.). **Biophysical characteristics of the Tomato-ringspot virus.**—*Phytopathology*, 45, 6, pp. 334–337, 1 fig., 1 diag., 1955.

At Camp Detrick, Frederick, Maryland, preparations from tobacco plants infected by Price's isolate of the tomato ring spot virus (tobacco ring spot virus No. 2) [*R.A.M.*, 19, p. 668; 28, p. 492] and from healthy ones were subjected to differential centrifugation and then to electrophoretic fractionation [33, pp. 506, 764]. After an hour of electrophoresis four components were discernible in the diseased material as compared with only one in the virus-free, and after 312 minutes five fractions were separated. The results of infectivity tests and optical density determinations for each fraction indicated that the virus (or nucleoprotein) was associated with the slowest moving, the mobility of which was $2{\cdot}4 \times 10^{-5}$ cm.^{2} volt^{-1} sec^{-1}. The correlation coefficient between counts of local lesions on Wilt Resistant or Black cowpeas and of particles on electron micrographs was 0·997, denoting an association between infectivity and the type of particles recorded.

Darby (J. F.). **A progress report on gray mould and ghost spot of Tomatoes and their control.**—*Plant Dis. Reptr*, 39, 2, pp. 91–97, 5 figs., 1955. [Multilithed.]

Descriptions are given of grey mould (*Botrytis cinerea*) [*R.A.M.*, 17, p. 566; 32, p. 648 *et passim*] and ghost spot, which are becoming serious diseases on tomatoes in Florida. Ghost spot, possibly due to a fungus, is usually found in fields where grey mould was present earlier in the season. It produces whitish rings or halos 3 to 6 mm. in diameter, mostly on the shoulder of young fruit $\frac{1}{2}$ to $1\frac{1}{2}$ in. in diameter, without otherwise affecting the quality of the fruit.

In field trials from 1951 to 1954 in which 20 sprays were given at three- to seven-day intervals 50 per cent. wettable dichlone [34, p. 164] at $\frac{3}{4}$ lb. to 100 gals. was the most effective of the fungicides tested for the control of both diseases, but was ineffective against grey leaf spot (*Stemphylium solani*) [34, p. 680]. Alternating dichlone with zineb, nabam-zinc sulphate, or maneb overcame this, and mixtures of dichlone and zineb ($\frac{1}{2}$, $1\frac{1}{2}$ or $\frac{3}{8}$, 1) gave promising control of all three diseases.

Perlasca (G.) & Malaguti (G.). **Ensayos de cultivo de Tomate en la epoca de lluvias.** [Experiments on growing Tomatoes in the rainy season.]—*Agron. trop., Maracay*, 4, 2, pp. 95–97, 1954. [Received 1955.]

An attempt was made at Sanare, Venezuela, at 1,300 m., to obtain a satisfactory yield from unstaked Marglobe tomato plants between October and December, 1952, using fungicides to control *Phytophthora infestans* [*R.A.M.*, 27, p. 391]. Thirteen applications were made with each of nine fungicides. On untreated plants leaf infection was graded as 97·6 and the yield was 1·1 kg. per ha. The best control was obtained with 0·3 per cent. phygon XL, resulting in a yield of 16·148 kg. per ha. and giving grade 14·4 leaf infection, followed by 0·5 per cent. captan, 14·252 kg. and 39·6 infection.

Gothoskar (S. S.), Scheffer (R. P.), Stahmann (M. A.), & Walker (J. C.). **Further studies on the nature of Fusarium resistance in Tomato.**—*Phytopathology*, 45, 6, pp. 303–307, 1955.

At the Department of Plant Pathology, University of Wisconsin, extracts of single-gene resistant Jefferson tomato plants failed to inhibit the growth of *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* [*R.A.M.*, 33, p. 691 and next abstract] in a double-strength Czapek-Dox medium. Cuttings of both Jefferson and the susceptible Bonny Best variety reacted to treatment with culture

filtrates and commercial pectinase by the development of similar disease symptoms, so that resistance could hardly be attributed to a mechanism of detoxicification in resistant plants only. The resistance of Jefferson cuttings was broken down by treatment with the respiratory inhibitors 2,4-D, thiourea, sodium fluoride, and sodium diethyl dithiocarbamate, which exerted no stimulatory effect on the pathogen *in vitro*. It is postulated, therefore, that resistance to *F. b.* var. *lycopersici* is closely associated with the metabolism of the host and is probably derived from a very labile substance continuously formed at the expense of energy obtained from respiratory processes.

Gothoskar (S. S.), Scheffer (R. P.), Walker (J. C.), & Stahmann (M. A.). **The role of enzymes in the development of Fusarium wilt of Tomato.**—*Phytopathology*, 45, 7, pp. 381–387, 1955.

In further studies at the Departments of Biochemistry and Plant Pathology, University of Wisconsin, filtrates from cultures of *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* [see preceding abstract] on moist wheat bran extracted with water caused vascular browning and wilt in Bonny Best tomato plants. The active factor in the filtrate was heat-labile and non-dialysable, and its action suggested the involvement of an enzymatic response. Of five commercial enzyme preparations tested on tomato cuttings, only one with pectic enzyme activity, pectinol 100 D, duplicated both the wilting and browning effects induced by the culture filtrates. A correlation was established between the severity of vascular browning and pectin methyl esterase activity. An active pectic enzyme preparation was isolated from the culture filtrates by precipitation with alcohol. It showed pectin methyl esterase and depolymerase activity and caused the wilting and vascular browning specifically associated with infection by *F. b.* var. *lycopersici*, indicating the close relationship between these symptoms and the pectic enzymes produced by the fungus.

Bloom (J. R.) & Walker (J. C.). **Effect of nutrient sprays on Fusarium wilt of Tomato.**—*Phytopathology*, 45, 8, pp. 443–444, 1955.

The results of a study of the influence of supplementary foliar sprays containing various concentrations of several nutrients on the tomato wilt caused by *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* are reported from the Department of Plant Pathology, University of Wisconsin [*R.A.M.*, 26, p. 473 and cf. preceding abstracts]. When nitrogen in the form of urea was supplied through the roots before inoculation to plants of the susceptible Bonny Best variety growing in a balanced solution, the disease was retarded progressively with increasing concentrations from 0 to 0·4 M, whereas an exactly opposite effect resulted from the same treatment after inoculation. The use of potassium chloride before inoculation did not significantly affect wilt development, but post-inoculation treatments were followed by an increase in the disease index with rising concentrations. Sodium chloride acted similarly to potassium chloride, but calcium chloride was without significant influence on the disease. However, when potassium and calcium chlorides were combined in a foliar spray the effects of the former were counteracted by the latter. No appreciable modifications in the course of the disease were induced by the supply of monobasic sodium phosphate, sodium glycerophosphate, magnesium sulphate, or magnesium chloride to the plants.

Pantidou (Maria E.) & Schroeder (W. T.). **Foliage as a source of secondary inoculum for Tomato anthracnose.**—*Phytopathology*, 45, 6, pp. 338–345, 4 figs., 1955.

This is an expanded, tabulated account of studies at the New York Agricultural Experiment Station, Geneva, on the origin of foliar infection by *Colletotrichum*

phomoides on tomato [*R.A.M.*, 24, p. 168; 27, pp. 391–392] and its significance in the development of fruit anthracnose, some of the results of which have already been noticed from another source [34, p. 407]. In greenhouse experiments leaf tissue of the Gem variety was penetrated within 24 hours, profuse sporulation following under very humid conditions, especially on the lower leaves in contact with the soil. The tests yielded conclusive evidence (which was subsequently confirmed in the field) that diseased foliage provided sufficient inoculum to be of material importance in fruit infection.

Jain (A. C.). **Cercospora leaf-spot of Tomato.**—*Sci. & Cult.*, 21, 1, pp. 42–43, 1955.

The *Cercospora* species, first observed causing leaf spot and defoliation of tomato in Madhya Pradesh in 1953, was identified at the College of Agriculture, Nagpur, India, as *C. fuligena* [cf. *R.A.M.*, 31, p. 151].

Clarke (E. J.). **Some aspects of Tomato breeding at the Albert College.**—*Sci. Hort.*, 11 (*1952–54*), pp. 140–149, 2 pl., 1 fig., 1955.

In work at Glasnevin, Eire, to develop true-breeding tomato varieties resistant to leaf mould (*Cladosporium fulvum*) [*R.A.M.*, 24, p. 210; 34, p. 111] it was found that resistance seemed to be linked with smallness of fruit and also that a genetical leaf spot necrosis [24, p. 210] developed in F_2 resistant hybrids. The small fruit problem can be overcome by back-crossing, which, however, has drawbacks. It is possible to reduce leaf spot by breeding and selection.

The dominant character of leaf mould resistance enables heavily cropping, resistant strains to be obtained by using F_1 resistant hybrids which offer great opportunities for increasing the yields of glasshouse tomatoes. Crossing commercial types gave better results than using non-commercial; intra-crossing was no better than normal selfing.

Sap inoculations made in 1947 and 1948 in attempts to transmit leaf spot necrosis gave negative results, which seems to preclude a virus as the cause. Scions from spot-affected material grafted in 1948 on Radio seedlings, both known to be virus-free, developed serious leaf spot, while the Radio stock remained healthy. With few exceptions, leaf spot did not occur in the F_1 but was invariably present in one-quarter of the F_2. Seeds saved from affected parents germinated poorly and the progeny were liable to severe necrosis, while that from F_1 resistant strains or varieties like Single Cross may yield one-quarter affected by leaf mould and a further quarter by leaf spot necrosis. The two diseases rarely appeared on the same plant [cf. 27, p. 543].

Leaf spot necrosis may lead to the collapse of plant tops and failure of upper trusses. Typical figures of average yields per plant from seed of selfed spotted plants in 1947 were 2·05 lb., as against 6·91 lb. from a sister line of healthy selfs. Symptoms of leaf spot may be masked in a dull season or under high nitrogen conditions, while high potassium or prolonged sunshine coincident with the swelling of the first trusses may bring out or intensify the symptoms. They are also checked or inhibited by removing the fruit in the early stages of spotting.

Progeny from inter-species crosses were relatively unaffected by an attack of root rot by *Colletotrichum* [? *atramentarium*: 33, p. 655] which halved the yields from commercial varieties in the same house.

Coe (D. M.). **Progress report on the use of streptomycin for the control of bacterial spot of Tomatoes under field conditions on South Florida sandy soils.**—*Plant Dis. Reptr*, 39, 3, pp. 215–218, 1955. [Multilithed.]

At the Indian River Field Laboratory, Everglades Experiment Station, Florida, promising control of bacterial spot (*Xanthomonas vesicatoria*) of tomato [*R.A.M.*, 34, p. 190] was obtained under field conditions favourable to the spread of the

disease with five applications of streptomycin at 400 p.p.m. (a total of 500 gals. per acre) followed by three at 200 p.p.m. (450 gals.), using agrimycin-100 [34, p. 529]. Heavy infection was already established at the time of the first application. The average leaf spot infection was reduced from 8·8 (untreated) to 2·09 in a scale of 1 (no disease) to 10 (spotting severe with over 50 per cent. defoliation). Yields were increased from a total of 2,547·7 lb. to 3,616·95 lb. and the average fruit weight from 0·178 to 0·228 lb. Reduction in fruit spotting, however, was insufficient for good commercial control and the material cannot yet be recommended for use under local conditions.

Hall (C. B.) & Dennison (R. A.). **Environmental factors influencing vascular browning of Tomato fruits.**—*Proc. Amer. Soc. hort. Sci.*, 65, pp. 353–356, 1955.

Greenhouse experiments at the Florida Agricultural Experiment Station, Gainesville, indicated that shade and mist together were the prime factors contributing to the incidence of vascular browning in Rutgers tomato fruits [*R.A.M.*, 33, p. 645] grown in pans, crocks, and pots. Cool night temperatures were most deleterious when combined with either shade or mist, or both together. Soil compaction and the use of wax covers were also contributory factors.

Boyce (J. S.). **Forest plantation protection against diseases and insect pests.**—*F.A.O. For. Developm. Pap.* 3, v+41 pp., 1954.

In this monograph, the first of a proposed series on the various aspects of forest planting, the author outlines the general considerations for disease control, such as site selection, and the dangers of pure stands for the spread of pathogens. The hazards accompanying the introduction of exotic trees are cited, with examples, and the extension of the range of native trees discussed. The importance of seed provenance, often overlooked, is stressed. The artificial spread of pathogens is dealt with, many examples being quoted, and the desirability of preventing disease by sound practices at an early stage rather than facing the expense of later control is made clear. A bibliography of 71 titles is appended.

Mycology Branch.—*For. Res. India 1950–51*, pp. 51–55, 1955.

In this account of the mycological work at the Forest Research Institute, Dehra Dun, India [cf. *R.A.M.*, 32, p. 411], it is stated that thread blight (*Marasmius gordipes*) of sal [*Shorea robusta*: 33, p. 58] has been recorded in Madhya Pradesh, Orissa, Madras, and South India. *Fomes caryophylli*, previously collected from Bihar, Orissa, and Bengal, was found to be responsible for punk knots characteristic of the 'gaujy' disease of sal [32, p. 411]. A species of *Fomes* is causing heart rot of sal in natural regions where frost is absent. Burning, lopping, and poor soil conditions favour the disease. *Poria monticola* [cf. 34, p. 8], not previously reported as occurring naturally in India, is causing severe dry rot of chir [*Pinus longifolia*].

Beal (J. A.) & Hutchins (L. M.). **The role of the Forest Service in control of insects and diseases.**—*J. For.*, 53, 2, pp. 129–132, 4 figs., 1955.

This is a short account for the layman of the research activities and survey and control services provided by the Forest Service of the United States Department of Agriculture to combat diseases and pests. The measures dealing with plant diseases have been noted from time to time in this *Review*.

Norris (D. M.). **Natural spread of Endoconidiophora fagacearum Bretz to wounded red Oaks in Iowa.**—*Plant Dis. Reptr*, 39, 3, pp. 249–253, 2 graphs, 1955. [Multilithed.]

In studies on the spread of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: *R.A.M.*, 34, p. 757 and following abstracts] at Forest City and Lehigh, Iowa, 31 of 122 red oaks [*Quercus* spp.] wounded with a sterilized tool during the

period from 24th April to 22nd June became naturally infected, while the only two diseased of 217 unwounded were injured by rodents during the test period. The highest percentage of infection occurred in trees wounded from 11th to 22nd May. A single wounded red oak in the centre of a wilt-free group attracted insect vectors carrying sufficient inoculum to infect and kill it.

Engelhard (A. W.). **Occurrence of Oak wilt fungous mats and pads on members of the red and white Oak groups in Iowa.**—*Plant Dis. Reptr*, 39, 3, pp. 254–255, 1955. [Multilithed.]

Mats and pads of the oak wilt fungus (*Endoconidiophora fagacearum*) [*Chalara quercina*: see preceding and following abstracts] have been observed frequently on members of the red oak group (including *Quercus ellipsoidalis*) in Iowa since July, 1952. In the white oak group (including *Q. macrocarpa*) the furrowed, ridged, or flaky bark makes their detection by tapping the bark for hollow spots more difficult; mats and pads were, however, found on an inoculated specimen of *Q. macrocarpa* in May, 1954, and they may be less uncommon than previously supposed. The structures are found throughout the year, and form most prolifically during the periods from the third week in August to the end of October and the third week in April to the second week in June.

Yount (W. L.). **Longevity of the Oak wilt fungus in Oak roots as related to spread through root grafts.**—*Plant Dis. Reptr*, 39, 3, pp. 256–257, 1955. [Multilithed.]

Isolations made by the Pennsylvania Oak Wilt Survey, Department of Agriculture, Bureau of Plant Industry, Harrisburg, showed that *Endoconidiophora fagacearum* [*Chalara quercina*: see preceding and next abstracts] can live for three years or more in diseased oak roots. Several areas treated in 1951 by felling the diseased trees and all healthy ones within 50 ft. and applying ammate to the stumps [*R.A.M.*, 34, p. 114] had wilted trees round their perimeters by 1954. A more effective stump treatment to kill the fungus in the roots is needed.

Morris (C. L.). **Control of mat formation by the Oak wilt fungus by early felling of diseased trees.** *Plant Dis. Reptr*, 39, 3, pp. 258–260, 1955. [Multilithed.]

At the Division of Forest Research, Pennsylvania Department of Forests and Waters, Harrisburg, 182 oak trees in varying stages of foliar wilt due to *Endoconidiophora fagacearum* [*Chalara quercina*: see preceding abstracts] were either felled, deep-girdled, or treated with sodium arsenite painted on a band of exposed sapwood round the trunk in order to reduce the formation of mycelial mats. Mats were observed on only 1·3 per cent. of 153 trees treated by the three methods in stages of defoliation ranging from 20 to 100 per cent., provided treatment was applied within two weeks of complete defoliation. Of the 29 remaining infected trees, which were left to stand six weeks or longer before treatment, one-third showed mat formation.

Fergus (C. L.) & Cole (H.). **Longevity of the Oak wilt fungus stored under mineral oil.**—*Phytopathology*, 45, 7, p. 405, 1955.

A study was conducted at the Pennsylvania Agricultural Experiment Station to determine the possibility of storing the oak wilt fungus (*Endoconidiophora fagacearum*) [*Chalara quercina*: *R.A.M.*, 34, p. 114] under mineral oil [cf. 28, p. 231 *et passim*]. Fresh transfers of 15 isolates on test-tube slants of malt extract and potato dextrose agar were allowed to grow at 25° C. for 14 days, covered with a layer of mineral oil, and stored at 12°. Viability was tested annually for three years by subculturing the mycelium on malt extract agar in Petri dishes. In all the transfers the fungus grew away from the mycelium, developing its characteristic pattern and producing an abundance of conidiophores and endoconidia. Transplants from

the colonies of two third-year isolates were inoculated through cuts in the bark of two-year-old red oak [*Quercus* spp.] seedlings with positive results, typical foliar symptoms developing after 45 days. The fungus was reisolated from the diseased material. On spermatization with endoconidia of the appropriate compatibility type [33, p. 454] the cultures gave rise to numerous perithecia and ascospores.

Moreau (C.) & Moreau (M[ireille]). **Les maladies du Châtaignier en forêt de Marly.** [Diseases of the Chestnut tree in the forest of Marly.]—*Rev. for. franç. 1953*, 6, pp. 411–414, 1953.

Wilting chestnut trees in the forest of Marly, west of Paris, developed black, often unilateral, depressed zones near the base of the suckers, and dwarfing of the leaves on the affected side. Wilting was followed by defoliation, the dying suckers and branches developing cracks and numerous minute pustules and the bark peeling off easily. The depressed zones yielded cultures of *Diplodina castaneae* [cf. *R.A.M.*, 17, p. 355]; the pustules contained perithecia of *Cryptodiaporthe castanea* [18, p. 148; 31, p. 39]. Other fungi isolated from dead and dying trees were believed to be only saprophytes.

Campana (R. J.) & Carter (J. C.). **Spread of Dutch Elm disease in Illinois in 1954.** —*Plant Dis. Reptr*, 39, 3, pp. 245–248, 2 maps, 1955. [Multilithed.]

The large increase in European bark beetles [*Scolytus* spp.] on elm trees killed by the phloem necrosis virus [*R.A.M.*, 32, p. 286] and Dutch elm disease (*Ceratostomella ulmi*) [33, p. 390] is believed to be primarily responsible for the spread and intensification of *C. ulmi* in the southern half of Illinois in 1954. North of the phloem necrosis zone, extension of the disease was probably due to the extremely dry summers and mild winters of 1953 and 1954, which favoured the increase and survival of the beetles.

Hepting (G. H.). **A southwide survey for Sweetgum blight.**—*Plant Dis. Reptr*, 39, 3, pp. 261–265, 1955. [Multilithed.]

A survey carried out in 1954 by the Southeastern Forest Experiment Station, United States Forest Service, Asheville, North Carolina, showed that blight of sweet gum (*Liquidambar styraciflua*) [*R.A.M.*, 33, p. 511 and next abstract] was common throughout the southern United States although it caused serious mortality only in very localized areas. Generally there was a tendency to limited crown deterioration, particularly in Maryland. Severe die-back and death were more prevalent among elms than among sweet gums; other trees similarly affected were maple [*Acer* sp.], oak, sycamore [*Platanus occidentalis*], and ash. It is suggested that one or more sweet gum blights occur in almost every State in the sweet gum range and that the condition may be partly due to climatic or soil conditions. In Maryland, however, there appears to be a distinct and particularly aggressive type of decline.

Berry (F. H.). **Investigations of possible causes of Sweetgum blight.**—*Plant Dis. Reptr*, 39, 3, pp. 270–272, 1955. [Multilithed.]

Investigations at Beltsville, Maryland, on the possible causes of blight of sweet gum (*Liquidambar styraciflua*) showed that mortality of the smallest feeding rootlets of nine trees exhibiting early blight symptoms was over twice that in apparently healthy trees. It is suggested that death of the feeding roots may precede the crown symptoms, which may be a result of the reduced absorptive ability of the roots. Repeated isolations from the roots failed to yield any recognized pathogenic fungi.

Foster (R. E.). **Decay of Alpine Fir in the Upper Fraser region.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 10, 5, p. 3, 1954.

New analyses of data obtained in an earlier study [*R.A.M.*, 28, p. 430] of decay

of alpine fir [*Abies lasiocarpa*] in the Upper Fraser region of British Columbia showed that trees with forked stems and those bearing visible sporophores [of *Echinodontium tinctorium* and *Stereum sanguinolentum*: loc. cit.; 34, pp. 3, 681] were completely defective. Included in these classes were 26 per cent. of the total number of cull trees. Only 8 per cent. of the trees free from stump decay were highly defective elsewhere in the bole, whereas 60 to 76 per cent. of those containing a trace to large amounts of stump rot were culled on account of excessive defect. Trees 16 in. or more in diameter were in general very defective, though approximately 32 per cent. 8 to 14 in. in diameter were sound and a further 18 per cent. had only moderate amounts of defect.

Decay was not a problem in even-aged stands approximately 100 years old. Decay losses in uneven-aged stands averaged 32 per cent. (board-foot computations) in the areas sampled, and ranged (for 20 plots) from 6 to 62 per cent.

Lohwag (K.). **Wachstumsversuche mit Lenzites betulina (L.) Fr.** [Growth experiments with *Lenzites betulina* (L.) Fr.] —*Öst. bot. Z.*, 102, 4–5, pp. 524–528, 2 figs., 1955.

The author has already demonstrated the possibility of obtaining fruit bodies from the mycelia of lignicolous fungi in pure culture [*R.A.M.*, 32, p. 527]. In the experiments herein reported from [? the Institute for Soil Culture] Vienna, the inversion through an angle of 180° of cultures of *Lenzites betulina* [cf. 30, p. 65] on a medium of malt peptone agar with an admixture of beech sawdust resulted in the production of abnormal fructifications closely resembling morchelloid forms of the Agaricaceae.

Copeland (O. L.). **The effects of an artificially induced drought on shortleaf Pine.** —*J. For.*, 53, 4, pp. 262–264, 2 figs., 1955.

Field experiments in the Calhoun Experimental Forest, near Union, South Carolina, to determine the effect of reduced soil moisture on shortleaf pine (*Pinus echinata*) showed that trunk diameter, shoot growth, and needle length were curtailed, while the needle colour remained unaffected. Dying of the branches began at the base of the crown and gradually spread upwards, resulting in an undersized crown. Although an over-all decrease in total nitrogen uptake was observed the nitrogen content of the needles remained normal, suggesting that drought is not responsible for the little leaf disease (associated with *Phytophthora cinnamomi*) [*R.A.M.*, 34, p. 5].

Isaac (I.) & Davies (R. R.). **A new hyaline species of Verticillium : V. intertextum sp. nov.**—*Trans. Brit. mycol. Soc.*, 38, 2, pp. 143–156, 1 fig., 4 graphs, 1955.

Samples from a wilted Japanese maple (*Acer palmatum*) in Easthampton, Massachusetts, sent to the University College of Swansea, yielded a non-pathogenic *Verticillium* isolate which was designated *V. intertextum* n.sp. Pathogenicity tests at Swansea demonstrated *V. dahliae*, isolated from infected twigs, to be the cause of the disease [cf. *R.A.M.*, 20, p. 247; 27, p. 502]. All the inoculated seedlings began to wilt within five weeks of inoculation, *A. palmatum* and its variety *purpureum* reacting severely while var. *atropurpureum* developed only mild symptoms. *V. dahliae* was reisolated from all the infected seedlings. *V. intertextum*, however, was only present as a saprophyte or a very mild pathogen. It differed from hyaline variants of *V. dahliae* and *V. albo-atrum* in having a constantly floccose appearance due to mycelial 'ropes', and an orange to pink pigment in daylight. It also differed in its physiology.

Ziller (W. G.). **Studies of western tree rusts. II. Melampsora occidentalis and M. albertensis, two needle rusts of Douglas Fir.**—*Canad. J. Bot.*, 33, 2, pp. 177–188, 12 figs., 1955.

In a further contribution to this series [cf. *R.A.M.*, 34, p. 116] the only two rusts

on poplar in British Columbia, namely, *Melampsora occidentalis* on *Populus trichocarpa* and *M. albertensis* on *P. tremuloides*, were shown to have aecidial states on Douglas fir (*Pseudotsuga taxifolia*), one of which (previously described as *Caeoma occidentale*) was shown by inoculation experiments to be that of *M. occidentalis*. The two rusts are distinguished by the sizes of the aecidiospores, those of *M. occidentalis* being 22 to 27 by 26 to 35 μ while those of *M. albertensis* are 16 to 21 by 19 to 26 μ.

Potlaichuk (V. I.). О специализации **Phomopsis quercella Died. и Cytospora intermedia Sacc.** [Concerning the specialization of *Phomopsis quercella* Died. and *Cytospora intermedia* Sacc.]—Труд. всес. Инст. Защит. Раст [*Trans. Pan-., Soviet Inst. Plant Prot.*], *1954*, 6, pp. 200–206, 1954.

In laboratory and field experiments in the U.S.S.R. *Phomopsis quercella* [cf. *R.A.M.*, 21, p. 272] infected seeds of oak, pear, and ash and seedlings of maple [*Acer* sp.], oak, and ash, in addition to acorns, while *Cytospora* [*Valsa*] *intermedia* [loc. cit.] was confined to acorns.

Plakidas (A. G.). **Spot anthracnose of Chinese Holly.**—*Plant Dis. Reptr.* 39, 3, pp. 243–244, 1 fig., 1955. [Multilithed.]

This information on spot anthracnose (*Elsinoe*) [*ilicis*] of Chinese holly trees (*Ilex cornuta*) at Hammond, Louisiana, has already been noticed from another source [*R.A.M.*, 34, p. 193].

Van der Westhuizen (G. C. A.). **Diplodia die-back of Pine trees.**—*Fmg in S. Afr.*, 30, 349, pp. 229–230, 2 figs., 1955.

All pine species grown in South Africa are affected to some extent by *Diplodia pinea* [*R.A.M.*, 33, p. 657] which sometimes causes severe losses, particularly in the Cape Midlands. The author recapitulates the symptoms of the disease and concludes that *D. pinea* is a weak parasite only infecting and damaging trees weakened by other causes, usually unfavourable soil moisture conditions. Incidence may be kept to a minimum by proper site selection, stand thinning, and pruning.

Aaron (J. R.) & Wilson (K.). **Soft-rotting fungi in timber. The use of the polarizing microscope.**—*Wood*, 20, 5, pp. 186–189, 6 figs., 1 diag., 1955.

The use of the polarizing microscope is advocated for the early detection of timber soft rot caused by ascomycetes [*R.A.M.*, 34, p. 414]. Cavities in the cell wall caused by the loss of crystalline cellulose are apparent as dark areas against the illuminated wall, and are best observed in longitudinal sections. The middle and inner parts of the cell walls are attacked first, while the outer wall and particularly the bordered pits are more resistant [cf. 34, p. 562].

The early diagnosis of soft rot, which was frequently attributed in the past to chemical causes or weathering, is important in timber used in conditions unfavourable for the development of basidiomycetes, as in cooling towers, where *Chaetomium globosum* [loc. cit.] causes breakdown of the slats.

Wagener (W. W.) & Davidson (R. W.). **Heart rots in living trees.**—*Bot. Rev.*, 20, 2, pp. 61–134, 1954.

This comprehensive account of the information available concerning heart rots deals with the fungi responsible, their spread and establishment in trees, the nature and progress of decay and the many factors influencing it, its effects, the losses caused, and the means of avoidance. A bibliography of 345 titles is appended.

Ruberu (T. R. A.). **Note on a wood-rotting fungus on Sapu Favolus ciliaris Mont.**—*Ceylon For.* (N.S.), 2, 2, pp. 80–84, 1 pl., 1955.

Favolus ciliaris [cf. *R.A.M.*, 33, p. 450], causing timber decay of sapu (*Michelia*

champaca) in Ceylon, is described as it appears in nature and on artificial media under laboratory conditions.

Lekander (B.) & Rennerfelt (E.). **Undersökningar över insekts- och blånadsskador på sågtimmer.** [Investigations of damage to saw timber from insects and blueing.] –*Medd. SkogsforsknInst. Stockh.*, 45, 8, pp. 5 36, 14 figs., 10 graphs, 1955. [English summary.]

This fully tabulated survey of investigations from 1951 to 1953 on the damage to saw timber from the joint depredations of bark beetles and blueing fungi is concerned mainly with the entomological side of the problem, the mycological aspect of which has already been studied [*R.A.M.*, 34, p. 394].

Rennerfelt (E.) & Nacht (Gertrud). **The fungicidal activity of some constituents from heartwood of conifers.**—*Svensk bot. Tidskr.*, 49, 3, pp. 419–432, 6 graphs, 1955.

Some 20 substances extracted from the heartwood of different kinds of conifers were tested at the Forest Research Institute, Stockholm, for their toxic effect on fungi, trees known to have resistant heartwood yielding fungicidal substances [*R.A.M.*, 29, p. 447; 30, p. 6]. For example, from *Callitris*, *Chamaecyparis*, *Cupressus*, *Libocedrus*, *Thuja*, and other genera of the Cupressaceae, several strongly fungicidal substances mostly of a terpenoid nature have been isolated. The following were among them. From *Chamaecyparis taiwanensis* β-thujaplicin, 'callitrol', carvacrol, and another phenol called chamenol were obtained, and from Alaska yellow cedar (*C. nootkatensis*) a tropolone, nootkatin, related to β-thujaplicin, but with five additional carbon atoms; this species also contains the terpenoid acids chamic and chaminic acid, the former converting with alkali to *iso*chamic acid. Nootkatin is present also in *Cupressus macrocarpa*.

Dacrydium cupressinum, *Podocarpus ferrugineus*, *P. totara*, *Chamaecyparis obtusa*, and the Japanese Hiba tree, *Thujopsis dolabrata*, the last containing citronellic acid, all have resistant heartwood. The causes of the resistance of *Cryptomeria*, *Sequoia*, *Taxodium*, *Cedrus* spp., and larch are not yet known.

Pinosylvin (compounds giving pine heartwood its resistance), pinosylvinmonomethylether, carvacrol, thymoquinone, α-, β-, γ-thujaplicin, nootkatin, chamic acid, and *iso*chamic acid, tested by placing a crystal or drop in a Petri dish of malt extract agar inoculated with 200,000 spores of the blue stain fungus *Pullularia pullulans*, proved fungicidal.

In malt agar *Merulius lacrymans*, *Coniophora puteana*, *Fomes annosus*, *Peniophora gigantea*, *Polyporus balsameus*, *Poria sericeo-mollis*, and *P. vaporaria* [loc. cit.] were inhibited by 0·001 to 0·005 per cent. pinosylvin, other test fungi requiring 0·01 to 0·02 or more. In general the reactions to the monomethylether were similar, except that *Lentinus lepideus* was inhibited by 0·005 per cent. but *Peniophora gigantea* needed more than 0·02. All the foregoing fungi and *Ophiostoma* [*Ceratocystis*] *pini* were also inhibited by nootkatin at 0·001 to 0·002 per cent. *C. puteana*, *F. annosus*, *L. lepideus*, *Polyporus* [*Polystictus*] *abietinus*, and *Poria vaporaria* were inhibited by γ-thujaplicin in concentrations ranging from 0·0005 to 0·002. *F. annosus*, *Peniophora gigantea*, *Polystictus abietinus*, *Fusarium culmorum*, *F. oxysporum*, and *O. pini* needed 0·1 to 0·2 of 2, 4 dihydroxyphenanthrene and chamic acid. The two *Fusarium* species were inhibited by the highest concentration of pinosylvin but not by its monomethylether; neither substance inhibited *O. pini*. Concentrations which, after about ten days, stopped the growth of the mycelium of most fungi did not as a rule kill it; sometimes the highest concentration tested failed to kill within the time it acted on the mycelia.

Mathiesen-Käärik (Aino). **Einige Untersuchungen über den Sporengehalt der Luft in einigen Bretterhöfen und in Stockholm.** [Some investigations on the spore content of the air in some timber yards and in Stockholm.]—*Svensk bot. Tidskr.*, 49, 3, pp. 437–459, 2 figs., 3 graphs, 1955.

The spore content of the air in a park at the Experiment Station in Stockholm in 1953 [*R.A.M.*, 26, p. 500], measured by the Petri dish method, was found to be highest between July and September, with a maximum of 223 spores per sq. dm. per hour. The most frequent were those of *Cladosporium* (28·8 per cent.), *Pullularia* (6·8), *Torula* (2·2), and *Penicillium* plus *Aspergillus* (8). In the laboratory the spore content was less than outside, but maxima occurred at the same time. Ultra-violet irradiation had good results in sterilizing the air. In samples taken at the same time in a well-run sawmill at Skutskär there were 60 spores per sq. dm. per hour in August; percentages of the most frequent fungi, in the same sequence as above, were 21·9, 4·7, 2·1, and 20·1, the corresponding figures for other timber yards being 32, 4·4, 0·5, and 24·1. Samples taken between July and November in these yards had a total spore content mostly considerably higher than that in the park, with a maximum of 893 spores per sq. dm. per hour in October. *Ophiostoma* [*Ceratocystis*] *pini* was detected in all three sampling areas but *O.* [*C.*] *piceae* only in the timber yards.

Walter (G. R.). **Organic acid production by some wood-rotting basidiomycetes.**—*Diss. Abstr.*, 15, 3, p. 321, 1955.

In studies at Syracuse University, New York, in which *Polyporus palustris* was grown under controlled conditions in a chemically defined medium greater yields of oxalic acid [*R.A.M.*, 33, p. 514] resulted from increasing the glucose concentrations to at least 9 per cent. Thiamine-deficient cultures produced approximately two-thirds as much oxalate in 72 hours as those containing 2 mg. per l. Arsenite and fluoride inhibited acid production. Glycolic and succinic acids, with or without oxalic acid, were detected in the culture fluids of 20 wood-rotting fungi by colorimetric and chromatographic techniques.

Chorin (M.), Palti (J.), & Moeller (S.). **Leaf, stem and fruit diseases of vegetables of the Cucurbitaceae, Cruciferae, Umbelliferae and Liliaceae in Israel.**—v+75 pp., 26 figs., Tel-Aviv, 'Sifriath Massadeh', 1954. [Hebrew, with English summary.]

In the third booklet of this series [cf. *R.A.M.*, 31, p. 361] it is stated that in Israel *Pseudoperonospora cubensis* [32, p. 424] attacks only cucumbers and melons. All cucurbit crops are affected by powdery mildew (*Oidium* sp.), in one case identified as *Sphaerotheca fuliginea* [cf. 32, p. 466]. *Peronospora* spp. [*P.? parasitica*: 32, p. 424] are serious parasites of all brassica crops during the rainy winter season. Considerable damage from *Xanthomonas campestris* is sustained by cabbage and cauliflower crops on the coastal plain, although some resistance is shown by Japanese varieties of the latter. A limiting factor in the production of cauliflower seed is attack by *Sclerotinia sclerotiorum* [24, p. 253] in spring, and this fungus in addition damages carrots in winter and also in storage. In the coastal plain celery losses due to *Septoria apii* [cf. 32, p. 656] and *Cercospora apii* [loc. cit.] are frequently severe. Onion varieties of Eastern origin, known as 'Egyptian' and 'Cypriot', are highly susceptible to *P. destructor*, Spanish varieties are moderately susceptible, and 'Riverside' is strongly resistant. The raising of onion seed crops on the coastal plain is seriously hampered by this fungus combined with *Macrosporium parasiticum* [*Pleospora herbarum*: cf. 26, p. 436].

New vegetable varieties. List II.—*Proc. Amer. Soc. hort. Sci.*, 65, pp. 493–511, 1955.

In this supplement to List I [*R.A.M.*, 34, p. 10] the following varieties are among

those reported to possess disease resistance. The bean [*Phaseolus vulgaris*] varieties Golden Gem and Idaho Bountiful are resistant to curly top [virus: 31, p. 416], common bean mosaic, and a variant of this virus (bean virus 1 a), and Columbia to the first two only. All were released in 1954.

The Waltham Hicolor carrot released in 1955 is resistant to leaf blight [?*Alternaria dauci*].

Fruits of the Ilima cucumber, released in 1953, are not distorted by severe mosaic [virus]; the variety is adapted to regions where the virus is severe enough to harm partially resistant varieties.

The Anuenue lettuce, released in 1954, is resistant to tipburn.

Minn Honey muskmelon, released in 1954, is resistant to *Fusarium* [*bulbigenum* var. *niveum*].

Resistance to pink root [*Pyrenochaeta terrestris*: 34, p. 73], yellow dwarf [virus], and smut [*Urocystis cepulae*] is claimed for the Beltsville Bunching onion, released in 1951.

The tomato variety Urbana, released in 1952, is resistant to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*] while Blackhawk, released in 1954, is immune. Vagabond, released in 1954 also, resists races 1 to 9, inclusive, of *Cladosporium fulvum* [34, p. 111].

Ogilvie (L.). **Diseases of vegetables.** *Bull. Minist. Agric., Lond.*, 123, [iv+] 80 pp., 12 pl. (4 col.), 1954. 4*s*.

This is the fourth edition of the bulletin [*R.A.M.*, 29, p. 393], revised once more to embody the results of the latest research and experience.

Chattopadhyay (S. B.) & Mukharji (K.). **Black vein disease of Cabbage in West Bengal.**—*Sci. & Cult.*, 21, 2, pp. 107–108, 1955.

Black vein [rot] of cabbage (*Xanthomonas campestris*) [*R.A.M.*, 29, p. 548], not previously reported from West Bengal, India, is stated to be widespread and causing moderate to severe damage, particularly to young cabbages. Seed certification is suggested as the best remedy for this problem.

Bonnemaison (L.). **Protection des Betteraves et notamment des porte-graines contre la jaunisse.** [Protection of Beets and notably seed-producers against yellows.]—*C. R. Acad. Agric. Fr.*, 39, 16, pp. 752–759, 1953.

Beet yellows virus may reduce root yields in France by 30 to 40 per cent. and seed yields by 40 to 60 per cent. [*R.A.M.*, 30, pp. 256, 449]. Control should be directed towards reducing infection by the aphid vectors. It is too early to give definite recommendations but it is suggested that in seriously affected areas sowing should be early and thinning delayed to give a maximum number of plants per ha.

Where seed beets are acting as major virus reservoirs they should be kept together. It is best to sow after 15th July, the percentage of diseased plants decreasing as sowing is delayed, with few plants to a row and on well-prepared soil so that the seedlings develop rapidly. Seed-producers wishing to sow stecklings in the spring should experiment with planting late-maturing barley, oats, or flax as cover plants [34, p. 13]. One or two aphicide treatments applied in October to late- or early-sown stecklings would reduce infection by fourth-flight aphids and avoid their multiplication in the silos.

Schlösser (L. A.), Fuchs (W. H.), & Beiss (U.). **Über die Wirtsunkräuter des Rübengelbsuchtvirus (Corium betae).** [On the weed hosts of the Beet yellows virus (*Corium betae*).]—*NachrBl. dtsch. PflSchDienst*, 7, 4, pp. 59–60, 1955.

Of 21 weeds tested by inoculation with *Myzodes* [*Myzus*] *persicae* at the Research Institute of Kleinwanzleben Seed Culture AG., Einbeck, and the Institute for

Plant Pathology and Plant Protection of the University of Göttingen, Germany, eight proved to be hosts of beet yellows virus [cf. *R.A.M.*, 34, pp. 337, 693]. Inoculated plants of *Capsella bursa-pastoris* ceased to grow after four days and became chlorotic, the upper surface of the older leaves finally turning red to red-brown, and the leaves becoming turgescent. *Thlaspi arvense* stopped growing soon after infection, the plants reaching about one-quarter of the normal height. The leaves became yellow with green veins and brown-black necrotic spots. Parts of the plants died before flowering. Progressive vein-clearing spread from the base over the whole leaf of *Senecio vulgaris*, light yellow spots and red marginal discolorations appearing later. On *Polygonum convolvulus* symptoms were late in developing; older leaves showed clearing of the interveinal areas, and intensive marginal reddening. *Papaver rhoeas* ceased to grow ten days after infection; the leaf margins turned yellow, the older leaves red, and on all green parts yellow spots appeared. On *Chenopodium ficifolium* vein-clearing began eight to ten days after infection. Interveinal areas turned yellow and the small veins became brown, necrotic, and depressed on the lower surface of the leaf. On older leaves green stripes persisted along the veins and there were marginal red discolorations. *C. capitatum* showed a marked inhibition of growth, often leading to the early death of the plant. The youngest leaves of the rosette curled downwards, and marked vein-clearing was observed. Interveinal areas whitened, and older leaves turned red, with green veins. On *Atriplex nitens*, vein-clearing and yellowing of older leaves spread from the margin; later the symptoms disappeared, leaving only light yellow spots.

Most of these plants being annuals, their importance as virus reservoirs is small.

Frandsen (N. O.). **Untersuchungen über Cercospora beticola. I. Verhalten des Pilzes in künstlicher Kultur. II. Pigmentbildung.** [Studies on *Cercospora beticola*. I. Behaviour of the fungus in artificial culture. II. Pigment production.] –*Zucker*, 8, 20, pp. 431–436, 4 figs.; 21, pp. 469–472, 3 figs., 1955.

In cultural studies on *Cercospora beticola* at the Max Planck Institute for Breeding Research (Voldagsen and Rosenhof branches, Western Germany), individual strains freshly isolated from sugar beet, *Beta patellaris*, *B. lomatogona*, *B. trigyna*, and *Chenopodium album* showed morphological variations on potato dextrose and oat agars. Instead of the normal greenish-grey aerial mycelium most of the variants produced a pink or white growth, while two gave rise to reddish-brown colonies on potato dextrose agar. A similar phenomenon was observed in cultures of *Cercospora dubia* [*R.A.M.*, 25, p. 329] from *Chenopodium album* and *Cercospora mercurialis* from *Mercurialis annua*. In the light of these observations the distinction between the 'German' and 'American' forms of the fungus [31, p. 364] cannot be maintained; the former corresponds to the normal and the latter to the variant type. In inoculation experiments on the susceptible Kleinwanzleben E and the resistant Kleinwanzleben CR sugar beet varieties [34, p. 504], a normal isolate was more virulent than a variant, especially at lower temperatures (16·5° to 17·5° and 19·5° C.). The minimum, optimum, and maximum temperatures for the mycelial development of five strains of *C. beticola* (gauged by dry weight in potato dextrose extract) were approximately 5°, 23°, and 33° to 36°, respectively. The optimum for linear growth on potato dextrose agar was 27°. Contrary to v. Plotho's findings [31, p. 364], pectins appeared to exert no specific influence on conidial formation. Both *C. beticola* and *C. dubia* were completely autotrophic for vitamins on liquid media with pure mineral salts and glucose, and on synthetic substrates; in contrast to *C. mercurialis*, they utilized (besides ammonium salts) nitrates, egg albumin, casein-peptone, asparagine, and tyrosine, but not urea. All three species assimilated saccharose, lactose, and starch, while *C. beticola* (but not the other two) flourished on beet pectins and also liquefied gelatin.

A red pigment secreted by older or saltating cultures of *C. beticola* changes to

green at about pH 10. On oat agar all freshly isolated cultures of the pathogen produce a yellow pigment; *C. mercurialis*, *C. agni*, and *C. dubia* secrete the same yellow pigment in smaller quantities, but not the red. Pigmentation occurs independently of light or pH (between 5 and 8) but is influenced by temperature, being most abundant at the optimum.

WENZL (H.), GRAF (A.), MEINX (R.), & KREXNER (R.). **Über die Wirkung des innertherapeutischen Insektizides Systox gegen Cercospora beticola an Rübe.** [On the effect of the systemic insecticide systox against *Cercospora beticola* on Beet.]—*Pflanzenschutzber.*, 14. 5–6. pp. 65–75. 1955. [English summary.]

In a series of trials made from 1952 to 1954 in the field at Grabenegg and Fuchsenbigl and in the glasshouse at Wien-Augarten, Austria, it was found that spraying sugar beet with 0·1 and 0·2 per cent. systox significantly decreased infection by *Cercospora beticola* [*R.A.M.*, 34. p. 504].

WENZL (H.). **Erkennung der Rüben-Blattfleckenkrankheiten im Lupenbild.** [Diagnosis of Beet leaf-spot diseases through the magnifying glass.]—*Pflanzenarzt*, 8. 7, pp. 59–62, 10 figs., 1955.

As there are several beet leaf spot diseases, control measures can be accelerated or unwarranted alarm avoided by field diagnosis through a hand lens, instead of the more laborious microscopic examination. Photographs and detailed descriptions are given of various leaf spots as seen at magnifications ranging from four to seven times to enable the farmer to distinguish between non-parasitic necroses, *Cercospora beticola* [see preceding abstract], *Phoma betae* [*R.A.M.*, 32. p. 55], *Ramularia beticola* [cf. 34. p. 66], and *Alternaria tenuis* [32. p. 55], the last-named being frequently associated with 'leaf browning' caused by drought, heat, and nutrient deficiencies.

KOCH (F.). **Auswirkungen einer Ultraschallbehandlung von Rübensaatgut auf die Entwicklung des Cercosporabefalls.** [Effects of an ultrasonic treatment of Beet seed on the development of *Cercospora* infection.]—*Zucker*, 8. 2. pp. 30–31. 1955.

The results of an experiment undertaken in Lower Bavaria to determine the possibility of influencing the course of sugar beet seed infection by *Cercospora beticola* [cf. *R.A.M.*, 34. p. 336] through ultrasonic treatment are reported. Kleinwanzleben N seed was obtained from the 1951 harvest in south Germany, where practically every stand was heavily infected. The treatment was carried out in March, 1952, in a water bath at 18° C. Particulars regarding frequency and intensity were refused by the firm in charge of the proceedings.

The seed was sown 7th April, 1953, on good loess clay soil amended with a complete fertiliser, the sixfold replicated plots being divided into four series as follows: (1) untreated, (2) treated with alberten 50 [cf. 34. p. 15] at the rate of 800 gm. per doppelzentner [2 cwt.]; (3) ultrasonic treatment, no disinfection; and (4) both kinds of treatment. The plots of series (3) sustained the heaviest damage throughout the experiment, symptoms of leaf spot becoming apparent early in July; at the final reading on 28th October the average number of dead leaves per plant was 37·6 compared with 21·2, 18·8, and 23·6 in the plots of series (1), (2), and (4), respectively. Production was also adversely affected by the ultrasonic treatment, the leaf, root, and sugar yields (in doppelzentner per ha.) in series (3) being 173·2, 357·7, and 59·47, respectively, as against 255·1, 446·4, and 78·24 in (1), 257·9, 424, and 76·24 in (2), and 251·6, 442·1, and 77·18 in (4).

AEBI (H.) & RAPIN (J.). **Lutte contre la cercosporiose de la Betterave Sucrière.** [Control of cercosporiosis of Sugar Beet.]—*Rev. rom. Agric.* 10. 6. pp. 45–47. 3 figs., 1954.

In Switzerland leaf spot of sugar beet (*Cercospora beticola*) [*R.A.M.*, 33. pp. 207–

208] has become endemic. the damage depending mainly on weather conditions. warmth and moisture favouring the fungus. The following control measures are recommended: careful destruction of all debris after harvest; crop rotation. sugar beet being grown only once in three years. and not near last year's fields; seed disinfection, or use of seed-clusters at least two years old, as the sclerotic mycelia and conidia die during storage: beet leaves and collars should be fed to cattle in silage form only because if used fresh the manure may be contaminated and should not be used in beet fields.

The foliage should be sprayed (rather than dusted) with copper fungicides (not less than 2 kg. of copper in 300 to 1,200 l. per ha. depending on the type of machine) first in the middle of June or about three weeks before the usual date of appearance of the symptoms, and twice more at intervals of three to four weeks. or more often if rainfall is heavy.

The Federal Agricultural Experiment Stations recommend the following varieties in order of resistance: Buczynski CLR. Beta 242 53. Kleinwanzleben CR. Beta J 19, K 91, H 81, and Buczynski BP and P.

Dezeeuw (D. J.). **Fungicide treatment of table Beet and Spinach seeds for the prevention of damping-off.** —*Quart. Bull. Mich. agric. Exp. Sta.*, 37. 1. pp. 105–118, 1 fig., 1954.

Work designed to evaluate chemical seed treatments for the control of damping-off (*Pythium ultimum* and *Rhizoctonia* [*Corticium*] *solani*) of table beet [cf. *R.A.M.*, 33. p. 197] and spinach [cf. 33. p. 466: 34. p. 508] was carried out at the Department of Botany and Plant Pathology. Michigan Agricultural Experiment Station, from 1948 to 1953.

Experiments and screening tests were made with 45 seed disinfectants on the Detroit Dark Red variety of table beet and the Giant Noble variety of spinach. Of these. phygon (or phygon XL) and arasan (or arasan SF) were most consistently effective with beet. Yellow cuprocide was slightly more effective with spinach but less so with beet. Panogen. panogen-S. orthocide [captan] 75. orthocide seed guard. du Pont I D. merculine. and fermuline were promising. Vancide 51 was less effective than arasan and phygon. Actidione was ineffectual and. in strengths from 1 to 4 per cent., toxic to beet. Storage of treated seeds in the laboratory was not detrimental to germination.

In conclusion it is recommended to use phygon (50 per cent. active) or arasan (75 per cent. active) at 8 oz. per 100 lb. seed. dry or as a slurry. for both beet and spinach, and yellow cuprocide at 8 oz. per 100 lb. for spinach.

Hagedorn (D. J.) & Walker (J. C.). **Virus diseases of canning Peas in Wisconsin.** —*Res. Bull. Wis. agric. Exp. Sta.* 185, 32 pp., 14 figs., 1954.

The virus diseases affecting canning peas in Wisconsin have already been treated in various separate publications but this paper covers the six principal diseases, describing the distinguishing symptoms of each and the properties of the viruses concerned, namely, common pea mosaic virus [*R.A.M.*, 26. p. 1], mosaic caused by bean virus 2 [bean yellow mosaic virus: 33. p. 651], pea enation mosaic virus: 34. p. 201]. Wisconsin pea streak virus [34. p. 15]. Wisconsin pea stunt caused by red clover vein mosaic virus [31. p. 98]. and some strains of cucumber mosaic virus [28. p. 42]. There is also a brief discussion of some other pea viruses and means of identifying them.

Wallen (V. R.) & Skolko (A. J.). **Physiological specialization in Ascochyta pisi Lib.**—Abs. in *Proc. Canad. phytopath. Soc.*, 22. p. 18. 1954.

The pathogenicity of 62 isolates of *Ascochyta pisi* from peas in various parts of

Canada [*R.A.M.*, 34, p. 200] was tested using a number of pea varieties including Wisconsin Early Sweet, Arthur, Early Blue, Engress, Kelvedon Wonder, Profusion, Smallton, and Valley as differential hosts. Four forms or races of *A. pisi* have been distinguished, form 1 from western Ontario, forms 2 and 3 dominant in Ottawa, and form 4 found in the eastern provinces and Manitoba.

Cass Smith (W. P.). **Plant diseases. Ascochyta blight of Peas.** *J. Dep. Agric. W. Aust.*, Ser. 3, 3, 6, pp. 711–713, 3 figs., 1954.

Black spot or stem rot of peas is widespread in Western Australia during the wet winter months though of little consequence in the summer. Of the fungi responsible (*Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes*) [cf. *R.A.M.*, 34, pp. 202, 213] the last-named appears to be the most prevalent locally. The primary factor in control [21, p. 438: 22, p. 285] is the use of clean seed. Seed dusting, suitable cultural practices, and spraying with a fungicide containing thiram (1½ lb. per 100 gals.) are also recommended.

Last (F. T.) & Buxton (E. W.). **Photo-reactivation of Botrytis fabae Sardiña measured by a local-lesion technique.**—*Nature, Lond.*, 176, 4483, p. 655, 1955.

Preliminary experiments at Rothamsted Experimental Station demonstrated that discrete lesions of *Botrytis fabae* [*R.A.M.*, 33, p. 101] were uniformly distributed and easily counted 24 hours after the upper surfaces of Seville Longpod broad bean leaves were rubbed with a dilute spore suspension and incubated in a saturated atmosphere at 20° C. in darkness for 24 hours, thus providing a means of measuring the effect of ultra-violet radiation on the infective capacity of the spores. When halves of bean leaves thus inoculated were exposed for 3½ minutes to more than 95 per cent. of wave length 2537 A from a Hanovia XII lamp, the opposite halves being inoculated with unirradiated spores, about 90 per cent. of the original infectivity was destroyed. The rate of inactivation was also studied in plants kept in the light because exposure to visible light mitigates the effects of radiation. More lesions were produced on half leaves exposed to visible light than on those kept in darkness for 8 hours after inoculation, the disparity usually increasing as the period of exposure to light was prolonged. However, even after this period in darkness some spores were still photo-reactivated.

Roland (G.). **Note sur un virus attaquant les légumineuses.** [A note on a virus attacking pulses].—*Parasitica*, 11, 2, pp. 66–68, 1955.

In 1953 the author received from Gembloux, Belgium, two field bean plants (*Vicia faba* [var.] *minor*) of which one (A) displayed a form of mosaic, the leaf-blades being blistered and small, while on the other (B) the edges of the young leaves and the interveinal areas of the old ones were whitish.

The disease was successfully transmitted to pea seedlings of five varieties, but not to two varieties of field beans, by *Myzus persicae* fed for 24 hours on the affected plants and kept for 48 hours on the test plants, on all of which marginal yellowing of the middle leaves appeared 12 days after inoculation. These symptoms agreed fairly well with those described by Hubbeling as 'tip yellowing' of peas in West Germany and the Netherlands [*R.A.M.*, 34, p. 505], and the author proposes that the virus causing this yellowing of peas should be known as 'pea yellows virus' or *Pisum* virus 8.

It is concluded that plants A and B, though presenting different symptoms, were affected by the same virus. The symptoms on B were probably caused by the virus isolated, while those on A may have been due to another virus masking pea yellows. Another possible explanation is that plants A and B were genetically different and therefore reacted differently to the same virus.

Ozaki (C. T.). **The relative effectiveness of foliar applications of several manganese sources in correcting manganese deficiency.**—*Proc. Amer. Soc. hort. Sci.*, 65, pp. 313–316, 1 fig., 1955.

Experiments in 1954 at the Florida Everglades Experiment Station, Belle Glade, using Tendergreen snap beans [*Phaseolus vulgaris*] and Alabama Crowder peas, demonstrated that the relative effectiveness of manganese applied to correct deficiency [*R.A.M.*, 26, p. 41; 31, p. 95; 32, p. 542] was dependent upon the source of the element and the amount used and the crop under treatment. Sprays of manganese sulphate at 3 lb. per 100 gals. corrected deficiency in beans more effectively than sprays containing equivalent amounts of the element in the form of dioxide, oxide, oxysulphate, or EDTA [ethylene-diamine-tetra-acetate], whereas the last three forms resulted in significantly higher bean yields than the dioxide. At 9 lb. in 100 gals. dioxide corrected visual symptoms of manganese deficiency in the pea plants. The sources of manganese used did not significantly affect growth or yield in this host.

Németh (M.). **Incidence of a new wilt-disease of the Beans in Hungary.**—*Növénytermelés*, 3, 1–2, pp. 135–142, 1954. [Abs. in *Hung. agric. Rev.*, 3, 4, p. 11, 1954.]

A wilt disease of runner beans [*Phaseolus coccineus*], characterized by a sudden complete wilt at the time of the green maturity of the pods, blackening of the roots, which do not rot, and necrosis of the main and adventitious shoots and of the pods and petioles, was observed for the first time in Hungary in 1953 on certain varieties. Susceptibility to the disease, which is seed-borne, was inherited by the hybrids of these varieties. The disease is believed to be 'black root' [cf. *R.A.M.*, 31, p. 49; 33, p. 461], described as a supersensitive reaction to bean mosaic virus.

Porter (L. K.) & Thorne (D. W.). **Interrelation of carbon dioxide and bicarbonate ions in causing plant chlorosis.**—*Soil Sci.*, 79, 5, pp. 373–382, 1 graph, 1955.

At the Utah Agricultural College nutrient solution studies were conducted to determine the influence of carbon dioxide, bicarbonate ions, and pH on the chlorosis and nutrition of Great Northern bean [*Phaseolus vulgaris*] and Loran Blood tomato plants [cf. *R.A.M.*, 31, p. 297].

Air in combination with 10 mols. per l. sodium bicarbonate caused a decrease in both chlorophyll content and growth as compared with air and 0·3 mols. per l. sodium bicarbonate. With the pH of the solution cultures held constant and increases in concentration of sodium bicarbonate and carbon dioxide, the intensity of chlorosis was enhanced and plant growth declined. Increasing concentrations of sodium bicarbonate in cultures with constant pH values resulted in increasing concentrations of iron in tomato leaf and stem tissues and a similar trend in beans.

It is apparent from these findings that the bicarbonate ion is a direct causative factor in the development of chlorosis. Its action may be reduced to some extent by lowering the pH of the nutrient medium by increases in carbon dioxide in the aeration stream.

Kilpatrick (R. A.) & Hartwig (E. E.). **Fungus infection of Soybean seed as influenced by stink bug injury.**—*Plant Dis. Reptr*, 39, 2, pp. 177–180, 1 fig., 1955. [Multilithed.]

Co-operative investigations by the Field Crops Research Branch, United States Department of Agriculture, and the Delta Branch of the Mississippi Agricultural Experiment Station, Stoneville, showed that injury by stink bugs (*Nezara viridula*) is not necessary for fungus infection of soy-bean seed. The most common fungi isolated from seed of the varieties Ogden, Jackson, Roanoke, and Lee, in successively lesser amounts, were *Cercospora kikuchii* (more frequently isolated from

non-punctured seeds and often obtained from seeds without purple staining) [*R.A.M.*, 33, p. 699], *Chaetomium* sp., *Fusarium oxysporum*, *Cladosporium* spp., and *Aspergillus* sp.

Dunleavy (J.). **Soybean diseases in Iowa in 1954.**—*Plant Dis. Reptr*, 39, 2, pp. 169–170, 1 fig., 1955. [Multilithed.]

A survey of soy-bean diseases in Iowa in 1954 [*R.A.M.*, 34, p. 72] disclosed that *Fusarium* blight (*Fusarium* sp.) was particularly prevalent in the north-central area; *Phyllosticta* leaf spot (*P. sojicola*) [33, p. 525] affected almost all soy-beans planted after the first week in June and was particularly severe on seedlings; bacterial blight (*Pseudomonas glycinea*) [loc. cit.] caused severe initial defoliation in most fields in northern and central Iowa but was later of little consequence; bacterial pustule (*Xanthomonas phaseoli* var. *sojense*) [loc. cit.] was widespread in the southern area in late August and early September, affecting 50 to 97 per cent. of the leaves in half of the fields examined, but only 1 to 5 per cent. of the leaf area, and brown stem rot (*Cephalosporium gregatum*) [33, p. 574], occurring late in the season, was more prevalent than in recent years.

Zalasky (H.). **Infection studies in Septoria glycines Hemmi.**—Abs. in *Proc. Canad. phytopath. Soc.*, 22, p. 19, 1954.

In studies at the Ontario Agricultural College, Guelph, the penetration of soy-bean by *Septoria glycines* [*R.A.M.*, 25, p. 297] was shown to be stomatal, followed by intercellular spread into the mesophyll, the vein sheath parenchyma, and phloem. Pycnidia were found in the leaf and pericarp as well as in the seed coat. Intracellular hyphae occurred in the pod wall and near the hilum, and structurally there is no barrier to invasion of the seed via the placenta and funiculus. *S. glycines* is thus truly seed-borne in the soy-bean.

Page (O. T.). **Infection of Onion by Botrytis spp.**—Abs. in *Iowa St. Coll. J. Sci.*, 29, 3, pp. 474–475, 1955.

Spotting and blighting of onion leaves similar to that produced on the red and yellow varieties of onion in the field in Iowa by *Botrytis squamosa* [*R.A.M.*, 33, p. 200] was induced in the laboratory at Iowa State College when the plants were atomized with inoculum of *B. squamosa* and maintained with free water on the leaves, intermittent periods of low temperature, and a period of light. The name *Botrytis* leaf spot and wilt is proposed for this disease, 'blast' being confined to leaf spot and wilt symptoms of a physiologic nature.

No damping-off occurred when seeds were germinated under a subirrigated peat mulch inoculated with *B. allii*, *B. cinerea*, and *B. squamosa*, but in quartz sand contaminated with mycelium of *B. cinerea* a relatively high incidence was recorded. Tests of certain sprays for the field control of *Botrytis* leaf spot were begun in 1952 at the Holland-Bradford Marsh, Ontario, and continued during the 1953 growing season. Onion yields were increased by weekly sprays of manzate, parzate, or vancide.

Freeman (T. E.) & Tims (E. C.). **Antibiosis in relation to pink root of Shallots.**—*Phytopathology*, 45, 8, pp. 440–442, 2 figs., 1 graph, 1955.

At the Louisiana Agricultural Experiment Station in 1952 a comparative study was made of samples of two soils from the same field, in one of which, a silty clay, the shallots were severely infected by pink root (*Pyrenochaete terrestris*) [*R.A.M.*, 33, p. 332], while those on an adjacent portion with heavier clay were apparently healthy. The principal difference between the two soils, diluted 1 in 200,000 [cf. 29, p. 583], on a medium consisting of a lower layer of Conn's glycerol-asparaginate agar and an upper one of Czapek's sucrose-nitrate agar (the former promoting the

growth of actinomycetes and the latter that of *P. terrestris*), was the appreciably larger population of actinomycetes and the higher proportion of antagonistic forms in the non-infested sample. Thus, of the total 532 colonies found to be antagonistic to the pink-root fungus, 355 originated in the silty clay, compared with 177 in the heavier soil. In tests in steamed soil inoculated with *P. terrestris* all but four of 38 actinomycetes which had inhibited the growth of the pathogen *in vitro* reduced the incidence of infection to a greater or lesser degree, some affording almost complete control.

Sylvester (E. S.). **Lettuce mosaic virus transmission by the green Peach aphid.**—*Phytopathology*, 45, 7, pp. 357–370, 1 graph, 1955.

The studies on lettuce mosaic virus transmission herein reported from the Division of Entomology and Parasitology, University of California, Berkeley, supplemented by a list of 67 references, were undertaken because of the importance of the disease in the State [*R.A.M.*, 34, p. 569] and the need for further data on non-persistent vector-virus relationships [cf. 34, p. 691]. The results of tests on the Great Lakes variety demonstrated an acquisition threshold period of 11 to 15 seconds for non-infective apterae or late instar nymphs of *Myzus persicae* reared on radish. A linear gain in transmission efficiency resulted from increasing the length of acquisition feeding periods up to 30 seconds. An exponential increase in efficiency also occurred with lengthening periods of fasting from five to 240 minutes before an acquisition feeding.

The virus was retained longer by fasting than by feeding vectors. An increase in the access time on a virus source from five to 120 minutes caused an exponential reduction in transmission efficiency, but the rate of infectivity loss was slower than when comparable periods were spent on a virus-free host plant. Brief test feedings (average $14{\cdot}6 \pm 1{\cdot}33$ seconds) on a virus source plant enabled apterae previously starved for $3{\cdot}88 \pm 1{\cdot}94$ hours to transmit the virus serially, the number of infections per aphid following either a binominal or Poisson distribution with a range of one to four (mean 1·3) plants infected. A reduction in temperature from $23 \pm 0{\cdot}8°$ to $6 \pm 0{\cdot}9°$ C. decreased the effect of preliminary fasting on subsequent transmission. Alatae proved to be less efficient vectors than either apterae or nymphs.

Virus transmission by groups of aphids conformed to a binominal expectancy curve. Groups of at least 50 non-infective aphids feeding on lettuce seedlings for 24 hours before inoculation of the plants by individuals of *M. persicae* did not significantly reduce the susceptibility of the test plants. Some evidence was obtained that the host on which the aphids are reared exerts an influence on transmission, mustard, beet, and White Icicle radish being equally effective for the purpose, while peach seedlings were less so. Susceptibility to infection by aphid inoculation was enhanced by keeping test plants in the dark for 48 hours previously. The results of trials on plants between one and five weeks old denoted a gradual increase in susceptibility from the second week onwards.

Couch (H. B.) & Grogan (R. G.). **Etiology of Lettuce anthracnose and host range of the pathogen.**—*Phytopathology*, 45, 7, pp. 375–380, 2 figs., 1955.

The investigations on lettuce anthracnose (*Marssonina panattoniana*) described in this contribution from the Department of Plant Pathology, University of California, were concerned in the first instance with the source of primary inoculum [cf. *R.A.M.*, 20, p. 191] and other etiological factors capable of influencing the occurrence, development, and spread of the disease.

Conidia survived on lettuce seed for only seven days and in soil, held at a moisture equivalent of 22·5 per cent., for nine, but in February, 1953, seven months after the last active stages of infection were observed, anthracnose developed on plants grown in unscreened soil samples taken from a commerical field. Six months after the

disappearance of external symptoms of infection, isolations from healed lesions on old wild lettuce plants yielded cultures of *M. panattoniana*.

Infection developed on inoculated plants after only two hours in a saturated atmosphere. When sporulating lesions were exposed to a dry wind the conidia did not become detached, but when a moist air stream was passed over wetted lesions they were disconnected and moved in the air current. The host was entered both by direct penetration and through open stomata, the latter being the more usual channel.

Of 38 other members of the Compositae tested as potential hosts of the lettuce anthracnose fungus, only *Lactuca* spp. and *Bellis perennis* were susceptible; thus debris of wild or cultivated lettuce is regarded as the main source of anthracnose infection.

Hannon (C. I.). **Lettuce root rot studies.**—*Diss. Abstr.*, 15, 7, p. 1159, 1955.

For several years past many lettuce crops on muck soil in New York State have suffered losses of up to 60 per cent. or more from root rot. Variety 456 is particularly susceptible, early symptoms being dull leaf colour, chloronemia, wilted frame leaves, and general stunting of the plants. The root vascular system turns brown and later deteriorates; the surface of the root is often discoloured and deeply fissured, and secondary growth is poor. A form of *Pythium vexans* [*R.A.M.*, 26, p. 133] was isolated frequently in pure culture but only in the earliest stages of disease, and though the isolates caused stunting and death of several inoculated plants symptoms similar to those found in the field were not reproduced in greenhouse inoculations. In the field the disease appears to be favoured by low temperatures and high soil moisture, which are common to muck areas in the spring. Lettuces planted in late June and July sustained fewer losses than those planted early in spring. The results of field observations and data obtained from a large scale variety trial indicate that several varieties of cos and butterhead lettuce are highly resistant to or field immune from the disease.

Herold (F.) **Die 'Kranzfäule' (Blattrandbrand) der Endivie.** [The 'coronary rot' (leaf margin blight) of the Endive.]—*Phytopath. Z.*, 24, 1, pp. 43–54, 5 figs., 1955.

A remarkable leaf margin blight of endives in the market-garden area of Hamm, near Düsseldorf, Germany, was investigated from 1952 to 1954 and shown to be of physiological origin, occurring in soils with an unduly high salt content, e.g., in plots supplied with excessively large amounts of ammonium sulphate and 40 per cent. potash, especially in dry seasons. The yellow escariole type is the most susceptible, followed by green curly, while Green Bubikopf and green escariole are relatively resistant. The disorder appears to be identical with the so-called 'margins' of the same host in Holland (*Meded. Dir. Tuinb.*, 17, p. 811, 1954) and also presents certain analogies with 'fire' of lettuce in that country (ibid., 17, p. 615, 1954).

Pseudomonas marginalis [*R.A.M.*, 34, p. 340] is another cause of marginal blight of endives in Germany, but in this disease the younger leaves are principally involved, the originally isolated brown spots later coalescing successively into darker circles which stand out from the rest of the discoloured zone. On the other hand, the physiological disturbance mainly affects the central leaves, which are surrounded by a uniform, brown margin. The actual leaf surface is healthy, whereas in the bacterial disease individual foci are scattered over the entire lamina.

Asuyama (H.) & Yamanaka (S.). **Stem rot of Peanut.**—*Ann. phytopath. Soc. Japan*, 18, 1–2, pp. 28–32, 3 figs., 1953. [Japanese, with English summary. Received 1955.]

Since 1947 groundnuts in the Kanto district of Japan have been attacked by

a fungus, tentatively named *Diplodia natalensis* [cf. *R.A.M.*, 30. p. 505], causing a stem and petiole rot. Mature pycnidiospores are dark, 1 to 2-celled, and 19 to 30 by 10 to 17 μ. Cultures from groundnut were pathogenic also to beans [*Phaseolus vulgaris*], and caused rotting of melon, apple, Satsuma orange, maize ears, and cotton bolls, but induced only necrotic lesions on soy-bean, sweet potato, and *P. angularis*.

KATSURA (K.) & TOKURA (R.). **Studies on Phytophthora disease of economic plants. V. Some informations on the fungus causing the Phytophthora rot of Eggplant fruits.**—*Sci. Rep. Fac. Agric. Saikyo Univ.*, 5, pp. 119–134, 2 figs., 1953.

In a study of the *Phytophthora* rot of eggplants [*R.A.M.*, 19, p. 383] in Kyoto, Japan, the causal organism is considered to be *Phytophthora parasitica*, but some doubt exists as to its parasitism in the absence of injury.

VARMA (P. M.). **Ability of the white-fly to carry more than one virus simultaneously.**—*Curr. Sci.*, 24, 9, pp. 317–318, 2 figs., 1955.

At the Indian Agricultural Research Institute, New Delhi, the white fly (*Bemisia tabaci*) was found to be able to carry simultaneously the yellow vein mosaic of bhindi [*Hibiscus esculentus*: *R.A.M.*, 31, p. 466] and a yellow vein mosaic of pumpkin [34, p. 772] and infect healthy plants with both viruses on the same day. On pumpkin, yellow vein mosaic appears as pronounced vein clearing and irregular chlorotic patches on the lamina. Internodes turn yellow and the fruit, which is undersized, has yellow patches on the outside. The virus was also pathogenic to vegetable marrow and cucumber but not to *H. esculentus* or any other Malvaceae.

Mushroom Science—II. The Proceedings of the Second International Conference on Scientific Aspects of Mushroom Growing, held at the State Agricultural Institute, Gembloux, Belgium, 16th to 20th June, 1953. –183 pp., 7 figs., 10 diags., 23 graphs, Brussels, D. Branckaert, 1954. 12*s*.

At the second international conference on mushroom growing [cf. *R.A.M.*, 30, p. 554], P. HEINEMANN (pp. 6–11) discussed the nomenclature of the genus *Agaricus*.

A. F. M. REIJNDERS (pp. 11–15) described the development of the carpophores in the genus *Agaricus* with reference to previous work on the subject.

A preliminary study to discover the best technique for incorporating radio-active phosphorus (P_{32}) in mushroom compost was outlined by C. CORIN, J. LAUDET, and M. PICARD (pp. 15–20). The relation between the radioactivity of the freshly mixed compost and that after ashing gave a correction coefficient to be applied to subsequent measurements of the dry matter of the compost. Ninety per cent. of the P_{32} was recovered in mineral form, but the remaining organic fraction had not yet been analysed.

The nitrogen metabolism of mushrooms, with particular reference to the utilization of amino-acids, was investigated by J. CASIMIR and P. HEINEMANN (pp. 21–26) [32, p. 605] and compared with that of *Aspergillus niger* [21, p. 468].

Mme BOUILLENNE-WALRAND, Mlle L. ENGELS, and A. WILLAM (pp. 26–28) described experiments showing the stipes of cultivated mushrooms to be richer in auxins than the pileus and in the early stages of growth than after the opening of the veil.

A number of homobasidiomycetes have been grown on various solid media [cf. 32, p. 467] by L. ODDOUX (pp. 28–39), extracts of humus and moss being notably good ingredients. The greatest growth was obtained from *Boletus*, *Marasmius*, *Collybia*, *Mycena*, *Clitocybe*, *Melanoleuca*, *Lyophyllum*, *Rhodopaxillus*, *Naucoria*, *Hebeloma*, *Dryophila* [*Pholiota*], *Geophila* [*Stropharia*], *Conocybe*, *Lepiota*, and *Psalliota*. *Inocybe* and *Russula* would not as a rule grow in these cultures.

The results of a chromatographic study of the distribution of amino-acids in 20 species of agarics [32, p. 605] were contributed by M. Renard and J. Casimir (pp. 39–45), the principal one present being glutamic acid.

T. Trzcinski and J. Casimir (pp. 45–48) described the production of free amino-acids in mushroom compost, and the changes in their distribution as fermentation proceeds [29, p. 195]. Aspartic acid and asparagine disappear during fermentation, the amounts of glutamic acid and alamine lessen, while glycine and serine appear. Total nitrogen increases during fermentation but the concentration of amino-acids becomes less.

P. Heinemann and Mlle L. Engels (pp. 49–50) showed that organic acids are especially toxic to mushroom mycelium, attributing this effect to the carboxyl group. Abnormal fermentation may induce this toxicity in composts.

Studies carried out at the University of Wisconsin on strains of the cultivated mushroom occurring both naturally and artificially were described by B. B. Stoller and J. F. Stauffer (pp. 51–65). Spores of the variety Snow White were obtained from sporophores by allowing these to open, after external sterilization, in a closed sterile jar (Lambert, E. B., *Mycologia*, 21, pp. 333–335, 1929) and subjected to ultra-violet irradiation (2,750 Å). Some of the surviving spores produced mutant colonies.

Edith M. Sigel and J. W. Sinden (pp. 65–68) described a number of morphologically distinguishable variants which arise fairly regularly in multispore cultures of the mushroom strain D26, originally produced from a single spore and grown at the Butler County Mushroom Farm [United States] in a disused mine.

The position of mushroom production, both past and present, in Italy was briefly outlined by G. Borzini (pp. 68–69), that in France by P. Guiochon (pp. 69–75), in Belgium by G. Hild (pp. 75–82), in Germany by E. Hullen (pp. 82–83), in Denmark by C. R. Rasmussen (pp. 83–92) [*R.A.M.*, 32, p. 467], and in Great Britain by F. C. Atkins (pp. 92–95).

The conclusions to be drawn from experiments on changes in the time of casing and on the timing of initial watering and picking of mushrooms both closed and open, together with the results of different methods of sterilizing beds against pests and diseases were discussed by R. L. Edwards (pp. 96–102) in an account of investigations conducted by the Mushroom Research Station, Yaxley [32, p. 299].

M. Solari (pp. 102–109) described the conversion of a cave-growing system of mushroom production to the tray system, in France.

E. W. B. Van den Muijzenberg (pp. 109–112) traced the development of mushroom production in Holland, and P. A. Spoelstra (pp. 112–118) described methods of air-conditioning in Dutch houses.

In a new apparatus described by J. Delmas (pp. 118–123) and used at the St. Cyr Experimental Station, France [34, p. 698], the fermentation processes in manure can be controlled and the compost prepared more rapidly under differing conditions, enabling the reactions to be varied and studied. The part played by sulphur in humus has also been investigated.

Further information about their new short composting technique [cf. 32, p. 535] (*Mushroom Science*, 1, pp. 52–60) was contributed by J. W. Sinden and E. Hauser pp. 123–131). The process consists of two phases. In phase I, in the open, covering nine days, vertical sided piles 1·5 to 2 m. square in section are used, ample water being added to produce a moisture content of 250 per cent. of the dry weight, a temperature above 75° C., an ammonia content to give a pH above 8·5, and an oxygen content of 2 per cent. or more within the compost. In phase II, in the pasteurisation room, the temperature is at first artificially raised to 45°, eventually becoming 52° to 60°, good air circulation is maintained, and a relative humidity around 100 per cent. The first phase is essentially a chemical one, in which carbo-

hydrates are caramellized. The second is microbiological, the ammonia being converted into microbial protein, the pH lowered, and the reserves of insoluble organic nitrogen increased.

Experiments on the preparation of sawdust compost for mushrooms were reported by H. Rempe (pp. 131–133), but the use of this as an alternative to horse manure compost has met with varying success in practice.

J. B. Yoder and J. W. Sinden (pp. 133–139) described the use in America of a synthetic compost based mainly on ground maize cobs and hay with the addition of chemicals, which it is claimed yields better than manure.

Experiments with various casing soils carried out at the Institute of Horticultural Engineering, Wageningen, Holland, by Edith de Kleermaeker (pp. 139–142) showed that the highest yields (5·556 kg. per sq. m. after 11 weeks) were obtained on fine, granular, lime-rich clay at a pH of 8·2. The optimum pH (8 to 8·2) is as important a factor as the granular structure of the soil.

In experiments on the optimum structure of casing soils [32, p. 299] R. L. Edwards and P. B. Flegg (pp. 143–149) prepared artificial soil mixtures in which pore space and water holding capacity varied. Correlations were obtained between yields and dry pore space; rate of watering markedly affected yields. P. B. Flegg (pp. 149–161) also discussed pore space and related properties of casing materials.

Miss D. G. Gandy, Miss C. W. Duncan, and R. L. Edwards (pp. 167–175) described the control of truffle (*Pseudobalsamia microspora*) with copper sulphate.

Three mildew diseases of mushrooms in America, *Dactylium dendroides* [*Hypomyces rosellus*: 30, p. 555], *Didymocladium ternatum*, and *Trichoderma koningi* [*T. viride*: 18, p. 761], and their control were discussed by J. W. Sinden and E. Hauser (pp. 177–181). Dusting with 15 per cent. zineb and application of 15 per cent. calcium hypochlorite to individual infections are generally effective and zineb can be applied three times a week where conditions greatly favour the diseases. *H. rosellus* and *D. ternatum* are readily controlled thus, but *Trichoderma* is less amenable.

Bohus (G.), Heltay (I.), & Wonnesch (I.). **A Csiperkegomba termésmennyiségének növelésére irányuló kutatások.** [Researches to increase the crop production of the common Mushroom.]—*Ann. hist.-nat. Mus. hung.*, N.S., 5, pp. 105–120, 2 pl., 1 graph, 1954. [English and Russian summaries.]

Three variants produced from the common mushroom *Psalliota bispora* yielded good crops even under sub-optimum conditions and proved much better than the cultivated mushrooms used previously. P.c. 6 (*P. bispora* f. *pseudosylvatica*) was the best.

Barnes (W. C.) & Epps (W. M.). **Progress in breeding Cucumbers resistant to anthracnose and downy mildew.**—*Proc. Amer. Soc. hort. Sci.*, 65, pp. 409–415, 1 fig., 1955.

At Clemson College Truck Experiment Station, Charleston, South Carolina, a spore suspension of the anthracnose (*Colletotrichum lagenarium*) and downy mildew [*Pseudoperonospora cubensis*] pathogens combined was sprayed at about 10 lb. per sq. in. on to cucumber plants in the cotyledon to first true leaf stage both in the greenhouse and in the field. Anthracnose symptoms appeared on susceptible plants within three to seven days and resistance readings, rated on a scale from 0 to $\frac{1}{2}$ (field immune) to 5+(highly susceptible), were made in five to ten days, depending on the temperature. The symptoms on highly resistant plants [*R.A.M.*, 32, p. 465] developed one to three days later. Susceptible varieties such as Marketer (rating 5) were often killed by stem lesions or coalescing leaf lesions within five to seven days of inoculation. Preliminary inoculation tests indicated that fruit resistance

in highly resistant lines is essentially the same as that of the foliage. It was significant that less than 5 per cent. of the fruits of the highly resistant S.C. 50 were infected with anthracnose in spring, 1954, while all those on adjacent susceptible varieties were severely affected.

When field-immune P.I. 197087 [34, p. 274] was crossed with susceptible varieties the F_1 was intermediate in resistance to anthracnose. Where Palmetto (slightly tolerant) or related lines were used as the susceptible parent field tests showed the F_2 segregation in about 1,500 plants to be slightly more than 1 highly resistant to 3 susceptible in varying degrees, but only 1 to 15 with Marketer as parent. It is extremely unlikely that any plant as resistant as 197087 has ever been found in the F_2. It appears, therefore, that the inheritance of the high degree of resistance to anthracnose in this variety is controlled by several major genes, one of which is present in Palmetto. The results of selfing the original cross three or four times indicated that somewhat better resistance can be expected as these back-crosses are selfed to make them homozygous for all characters. It is believed that this degree of resistance is so high that anthracnose will seldom, if ever, be seen when these plants are grown under commercial conditions. Crosses between 197087 and S[outh] C[arolina] downy mildew-resistant lines [cf. 34, p. 10], backcrossed to the S.C. line in the F_1 and later generations, are producing fruits of excellent shape and colour that mature in the same season as the varieties now used. Crosses between 197087 and downy mildew-resistant pickle lines supplied by Associated Seed Growers yielded many plants with excellent resistance and pickle-type fruits though none will be ready for preliminary trials before 1956 or 1957.

Preliminary tests in 1954 indicated that the reaction of S.C. 50 to the new type of downy mildew resistance [34, p. 274] approaches immunity, with ratings not exceeding 0·5 as against 1·5 for Palmetto, thus paving the way for the development of varieties with resistance far superior to that of any variety available at present. 197087 is susceptible to a leaf spot caused by (?) *Macrosporium* or a related genus that does not attack American cucumber varieties.

Beecher (F. S.). **Control of downy mildew on Cucumbers and Muskmelons with tank mixtures of a fixed copper and a dithiocarbamate.**—*Plant Dis. Reptr*, 39, 3, p. 220, 1955. [Multilithed.]

At Beltsville, Maryland, a tank mixture of tribasic copper sulphate with dithane Z–78 (3:2:100) in 1953 gave the best control of downy mildew (*Pseudoperonospora cubensis*) on cucumber [*R.A.M.*, 34, p. 581], while on muskmelon [loc. cit.] a tribasic copper sulphate-ziram mixture (3:2:100) was somewhat better. In the 1954 field tests the mixture containing dithane Z–78 was the most effective on both hosts and superior to sprays of tribasic copper sulphate (4:100) alternated with dithane Z–78 (2:100), suggesting that certain mixtures possess some fungicidal value not inherent in the single ingredients when used alone.

Bhide (V. P.), Hegde (R. K.), & Sukapure (R. S.). **Fusarium wilts of Watermelon and Peas in Bombay State.** –*Curr. Sci.*, 24, 9, p. 310, 1955.

A *Fusarium*, indistinguishable from *F. oxysporum* f. [*F. bulbigenum* var.] *niveum*, caused serious damage to watermelon plants in January, 1955, in Bombay State. The fungus has not previously been reported on this crop in India. The *Fusarium* causing wilt of peas [*R.A.M.*, 31, p. 539] is regarded as indistinguishable from race 1 of *F.o.* f. *pisi*. The disease is now common in the Poona district and causes serious damage. Nine pea varieties resistant to wilt were obtained from the United States and Holland. All proved susceptible in greenhouse tests in Poona.

Bravenboer (L.) & Manintveld (Miss J. C.). **Chemische bestrijding van vruchtvuur (Cladosporium cucumerinum Ell. et Arth.) bij Platglaskomkommers.** [Chemical control of scab (*Cladosporium cucumerinum* Ell. & Arth.) on glass-

house Cucumbers.]—*Tijdschr. PlZiekt.*, 61, 4, pp. 105–121, 6 graphs, 1955. [English summary.]

Of 14 fungicides tested for the control of *Cladosporium cucumerinum* on cucumbers grown under glass at Naaldwijk, Holland, only bulbosan [*R.A.M.*, 34, p. 510] and an organic mercurial, F 55, were fully effective. A measure of protection was also conferred by zineb and phygon, the latter, however, causing stunting of the plants and leaf scorch.

The practical trials were supplemented by laboratory tests on 32 compounds, which were evaluated both by their direct action and by their vapour effects on mycelial growth, spore germination, and inoculated young plants. From a comparison of the resultant data it is clear that the most reliable indications of the practical value and phytotoxicity of the fungicides can be obtained by evaluating the vapour effects on spore germination and the young plants, respectively.

Walker (J. C.) & Pierson (C. F.). **Two new Cucumber varieties resistant to scab and mosaic.**—*Phytopathology*, 45, 8, pp. 451–453, 1955.

The two varieties of pickling cucumber resistant to scab [*Cladosporium cucumerinum*] already reported from the Wisconsin Agricultural Experiment Station [*R.A.M.*, 33, p. 135], one of which, SR 6, is widely used in the State, are susceptible to the destructive cucumber mosaic virus [33, p. 700]. However, another two released to the trade in 1954, Wisconsin SMR 9 and SMR 12, are highly resistant to both diseases under field conditions conducive to severe infection. The scab-resistant parent was derived from an F_3 homozygous scab-resistant progeny of a cross between Maine No. 2, also resistant to *C. cucumerinum*, and Chicago Pickling. It was crossed and back-crossed five times to M–20, a mosaic-resistant selection from Ohio. The new varieties resemble National Pickling in vine type and season, with slightly paler green fruits. The fruits of SMR 9 approximate closely to those of Ohio MR 17 in the ratio of length to diameter, while those of SMR 12 are intermediate between National Pickling and MR 17 in this respect. Both varieties equal in yield the susceptible pickling types in the absence of scab and mosaic and outyield the older mosaic-susceptible ones where the latter disease is prevalent.

Chamberlain (G. C.). **A progress report on studies of the dead arm disease of Grapes in the Niagara Peninsula.**—Abs. in *Proc. Canad. phytopath. Soc.*, 21, p. 12, 1953.

Vineyards of ten years old and upwards in the Niagara Peninsula, Canada, are commonly attacked by the pycnidial stage (*Fusicoccum*) of *Cryptosporella viticola* [*R.A.M.*, 32, p. 667]. The present high incidence of the disease is partially attributed to infection of the current season's growth in the form of small lesions on petioles, tendrils, and peduncles, in addition to the already recognised extensive necrotic cankers on the stem and arms. The most successful inoculations with *C. viticola* were through pruning wounds made in May, June, and July and it is considered necessary to make a reassessment of the apparent advantages of summer pruning in the control of the disease.

Stalder (L.). **Untersuchungen über die Graufäule (Botrytis cinerea Pers.) an Trauben. 2. Mitteilung.** [Studies on grey mould (*Botrytis cinerea* Pers.) of Grapes. Note 2.]—*Phytopath. Z.*, 22, 4, pp. 345–380, 1 fig., 8 graphs, 1954. [English summary.]

This second note [cf. *R.A.M.*, 33, p. 465] deals with the consumption of sugar and organic acids by *Botrytis cinerea* in synthetic nutrient solutions and grape juice, and the effect of certain nutrient substances on the growth of the fungus. Fruit acids were determined by the paper-chromatographic method [cf. 34, p. 522]. *B. cinerea* was dependent for growth mainly on the sugars of the nutrient

solution, which, contrary to widespread assumption, were consumed more quickly and in larger quantities than acids. The fungus absorbed all pentoses and mono- and di-saccharides, as well as starch and cellulose, some glucosides, and malic and tartaric but not oxalic or citric acids. Propionic and pyruvic acids inhibited growth, while the sodium salts of some organic fruit acids, absorbed in small amounts, although unsuitable as nutrients, activated growth. The nitrogen compounds analysed, ammonium sulphate and potassium nitrate, were utilised independently by the fungus, with consequent changes in the pH of the substrate, which in turn influenced the growth of the fungus and its absorption of other substances.

Verona (O.) & Perini (D.). **Danni prodotti dall'insorgere di cause avverse alla coltura della Vite.** [Damage produced by the development of conditions unfavourable to Vine culture.]—Reprinted from *Riv. Econ. agrar.*, 8, 3, 44 pp., 4 maps, 1953. [English and French summaries.]

The authors give an approximate estimate, based on questionnaires submitted to regional organizations, of the damage caused to vines in 1951 and 1952 by major pests and diseases in 74 Italian provinces. Assuming a possible total grape production of 73,903,704 quintals, losses amounted to about 11,047,512 quintals (14·9 per cent.), or more if factors such as frost and hail are considered. Of this approximately 5,136,358 quintals (47·2 per cent.) were lost by *Peronospora* [*Plasmopara viticola*], 3,111,071 (28·6) by *Oidium* [*Uncinula necator*], and 917,021 (8·4) by minor parasites such as grey mould [*Botrytis cinerea*]. In a severe disease year losses would be far greater. Fungicidal treatments varying in number are applied in all the provinces, but the above data give cause for doubt as to the efficiency of their timing and application, having regard to climatic conditions. Details of the losses in each province are tabulated.

Graniti (A.). **Osservazioni di campo sulla distribuzione, l'importanza economica e la sintomatologia della degenerazione infettiva della Vite in Sardegna.** [Field observations on the distribution, economic importance, and symptoms of infectious degeneration of the Vine in Sardinia.]—*Riv. Frutticolt.*, 16, 2, pp. 57–67, 10 figs., 1954. [French and English summaries.]

The disease described is considered to cause up to 15 per cent. loss of the grape crop in the Jerzu region of Sardinia. Its characteristics include a bushy appearance due to retarded bud development and dwarfing of the branches, stunting, especially of plants grown from cuttings of diseased vines, chlorosis, and various leaf abnormalities, including vein-clearing in the variety Pascale di Cagliari. Internodes are short, nodes swollen, and all parts become fasciated. Inflorescences are reduced in number and the swellings on rootlet tips and presence of endocellular cordons in the phloem and xylem are identical with symptoms of court-noué.

Morton (W. F.). **Grape-growing in British Columbia.**—*Hort. Circ. Dep. Agric. B.C.* 78, 24 pp., 11 figs., 1 diag., 1954.

This publication giving general information on commercial vine cultivation in British Columbia concludes with brief notes on two diseases. American grapes are frequently subject to chlorosis [*R.A.M.*, 33, p. 11], which may be temporarily controlled by spraying several times during the growing season with iron sulphate at 10 lb. per 100 gals. Permanent control has been obtained by grafting on to rootstocks of European vines such as Sibel.

Powdery mildew [*Uncinula necator*] causes considerable damage in some years to a few American varieties and American–European hybrids (Delaware and Rogers).

Ljubinković (B.). **Druga godina ogleda na suzbijanju plamenjače Vinove Loze.** [Second year of experimental control of downy mildew of the Grape Vine.]—

Zasht. Bilja (*Plant Prot., Beograd*), *1955*, 27, pp. 51–58, 1 graph, 1 map, 1955. [English summary.]

Further forecasts of vine downy mildew (*Plasmopara viticola*) in Serbia, Yugoslavia, in 1953 confirmed the previous conclusions [*R.A.M.*, 34, p. 428] that spray warnings can be based on meteorological data. During the period from 28th May to 3rd June there were widespread rains, and primary infections occurred on 31st of May. By 6th to 10th June mildewed leaves were observed in most parts of the country and by the middle of the month most of the susceptible varieties were completely infected.

Spray applications made on 5th June, immediately before the appearance of the first generation conidia, gave complete protection. When the first spray was delayed until 15th June, allowing two incubation periods [see next abstract] following primary infection, there was no control.

Jakovljević (R.). **Trajanje inkubacionog perioda prouzrokovača plamenjače Vinove Loze u Krajinskom vinogorju.** [Duration of the incubation period of the causal agent of downy mildew of the Grape Vine in the vine-growing district of Krajina.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1955*, 27, pp. 59–63, 1955. [English summary.]

At the Oenological Station, Bukovo, in the Krajina district of Yugoslavia, the incubation period of *Plasmopara viticola* on vine [see preceding abstract] in August, 1954, was found to be four to five days, corresponding to that in Vojvodina.

Engelbrecht (D. J.). **The latest developments in the control of bacterial blight (vlamsiekte) in the Western Cape Province.**—*Fmg in S. Afr.*, 30, 349, pp. 213–214, 219, 3 figs., 1955.

The disappointing results obtained in previous years in attempts to control vine bacterial blight (*Erwinia vitivora*) in South Africa by means of fungicides led to an all-out effort at control through the exclusive use of certified planting material [*R.A.M.*, 33, p. 658]. However, since nearly 37 newly infected farms were found in Paarl alone during 1952–3 further attempts were directed at restricting the primary spread to healthy vineyards by applying protective sprays early in spring when the shoots were only 2 in. long.

In preliminary experiments with knapsack sprayers four fortnightly applications of Bordeaux mixture (20 lb. in 100 gals.), plus a wetter, or captan 50 per cent. wettable powder (5 lb.) decreased blight infection. During 1953–4 the satisfactory results were maintained when the Bordeaux concentration was reduced to 16 in 100 and the captan to 4 in 100; 4 in 100 copper oxychloride and 4·4 in 100 copper oxysulphate (both wettable powders) were as effective as Bordeaux. The absence of the leaf phase of blight on vines treated with copper and captan, as compared with the severely infected control plots, suggests the possibility of gradually eliminating secondary shoot infection from old infected vineyards.

Gallay (R.), Wurgler (W.), Bovey (R.), Staehelin (M.), & Leyvraz (H.). **La dégénerescence infectieuse de la Vigne.** [Infectious degeneration of the Vine.] —*Rev. rom. Agric.*, 11, 3, pp. 17–24, 1 col. pl., 3 figs., 3 graphs, 1955.

The authors give an extensive review of infectious degeneration [court-noué] of the vine, the presence of which in French-speaking Switzerland was finally confirmed in 1950 [*R.A.M.*, 30, p. 403]. Reasons for considering it to be a virus disease and a summary of the symptoms are given. A great difficulty is the diagnosis at an early stage of growth when symptoms are not yet obvious. Of four methods suggested, viz., counting double nodes and fasciations, calculating the ratio of long to short internodes, microscope counts of endovascular cordons, and

observation of differential root development, none by itself is conclusive and each presents practical difficulties.

Further observations made from 1949 to 1954 at Pully, Saint-Prex, and Saint-Saphorin (Lavaux) on healthy Chasselas scions from Pully (H–S 14–33–5) and diseased from La Côte and Lavaux, grafted on healthy rootstock of *riparia* × *rupestris* 3309 and *riparia* × *berlandieri* 5C, showed that yield reduction was greater with diseased Chasselas from La Côte than from Lavaux, while scions on Pully rootstock 5C gave a somewhat lower yield than on 3309. During the period, yield reduction was most marked in the light, poor soil of Saint-Prex, which had borne diseased vines for a long time, and rather less on the normal soil of Pully and the heavier soil of Saint-Saphorin. Altogether, symptoms were more accentuated at Saint-Prex than at Saint-Saphorin.

A final chapter discusses the transmission of court-noué by grafting, soil, and vectors (*Phylloxera*) [*vastatrix*].

The authors conclude that the two cases of a decline reported eight years ago at Saint-Prex (La Côte) and Saint-Saphorin (Lavaux) [loc. cit.] are related but distinct forms of court-noué and can probably be ascribed to different viruses or virus complexes. These cases emphasize the seriousness of the disease, which markedly reduced the development of the vines and by inducing premature fruit fall caused crop losses precluding any economic return from the outset.

The disease is spread by infected scions and rootstocks and though there is as yet no experimental proof of soil transmission there are strong indications, supported by reports from other countries, that it does occur.

To prevent new outbreaks of the disease attention must be paid to the health of scions and rootstocks used in nurseries. Nurserymen should select exclusively scions and stocks from healthy vineyards. Improved legislation concerning the health of rootstock material is recommended, and although this might be enforced in local nurseries, it is difficult to check the quality of imported stock. Until a rapid test analogous to that available for potatoes is found the good faith of reliable suppliers, whose nurseries are under official supervision, will have to suffice. Unsatisfactory experiences with French stocks (Gamay du Beaujolais) indicate that the introduction of seedlings is dangerous and should be prohibited.

Work on the establishment of disease-free clones for each variety has been started at the Federal Agricultural Experiment Stations, Lausanne.

MÜLLNER (L.). **Open-field tests of new compositions for fighting Peronospora.**—*Mitt. Klosterneuburg*, Ser. A, *Rebe u. Wein*, 5, pp. 17–33, 1955. [German. Abs. in *Chem. Abstr.*, 49, 16, pp. 11226–11227, 1955.]

In field trials [in Austria] on the control of vine *Peronospora* [*Plasmopara viticola*: *R.A.M.*, 33, p. 704] 1·5 per cent. Bordeaux mixture, the same plus 0·2 per cent. copper-lime plus cosan, 0·2 or 0·3 per cent. dithane [34, p. 342], and 3 per cent. SR 406 (orthocide 50) [captan: 34, p. 275] conferred adequate protection, though the last-named may require to be supplemented by a copper treatment. Dithane and captan were non-phytotoxic but the copper-containing preparations repeatedly caused scorching. Dithane and captan also increased yields but impaired quality of the wine.

MAINGONNAT (A.). **Le mildiou en Tunisie.** [Mildew in Tunisia.]—*Progr. agric. vitic.*, 139, 27–28, pp. 20–21, 1953.

The author gives an account of the most serious outbreak of downy mildew [*Plasmopara viticola*] and brown rot [*Pseudopeziza tracheiphila*] of vine yet experienced in Tunisia, which occurred during 1953 when the rainfall amounted to 600 mm. as contrasted with the average over the past 40 years of 450 mm. The Alicante-Grenache variety showed some resistance to fruit infection.

Lafon (J.) & Couillaud (P.). **Essais de fongicides organiques dans la lutte contre le mildiou de la Vigne.** [Trials with organic fungicides in the control of Vine mildew.]—*C.R. Acad. Agric. Fr.*, 39, 16, pp. 744–747, 1953.

In trials for the control of vine downy mildew [*Plasmopara viticola*: *R.A.M.*, 33, p. 277] at the Viticultural Station, Cognac, France, during 1953, treatments were applied on 15th and 28th May, 16th June, 6th and 10th July, and 7th August. For the products used alone the numbers of leaves attacked on ten plants on 28th July were for 2 per cent. Bordeaux mixture, 117; 0·5 per cent. LO 738 dust (Rohm & Haas Co. containing 75 per cent. active sulphur), 170; 0·5 per cent. dithane, 224; and the untreated control, 580. The weights of the leaves remaining on 5th November on 20 plants given these treatments were 16·9, 11·5, 11·9, and 3·5 [? kg.], respectively, and for 0·5, 1, and 4 per cent. Bordeaux, 13·2, 15·5, and 17·8.

Four zineb and copper salt mixtures were tested for synergism: there was a marked synergistic effect between dithane and copper, increasing as the copper was used in more soluble form. Product A (37·5 per cent. micronized tetracupric copper oxychloride and 15 per cent. zineb) was compared with product B (12·5: 45), both used at 0·5 per cent., and with dithane plus Bordeaux mixture at varying percentages. The weights of leaves remaining on 20 plants on 5th November, 1953, were for 4 per cent. Bordeaux, 17·8 kg.; 2 per cent., 16·9; 1 per cent., 15·5; and 0·5 per cent., 13·2; product A, 18·4; product B, 18·1; 1·5 per cent. dithane, 19·6; 1 per cent., 15; 0·5 per cent., 11·9; and the untreated 3·5. The soluble copper and soluble dithane in A and B reacted to form copper ethylene bisdithiocarbamate. The adherence of this salt at the time of application and during rainfall and its relative insolubility account for the increased persistence obtained by combining dithane with a fairly soluble copper salt.

Of two copper salts of dithiocarbamic acid tested *in vitro* only copper ethylene bisdithiocarbamate was active against *P. viticola*, preventing sporangial germination and killing the zoospores. It was estimated that this effect was achieved by less than $\frac{1}{2}$ mgm. per l. of the copper salt and 1 mgm. per l. dithane. The toxicity threshold for metallic copper is about 1 mgm. per l.

Lee (C. L.). **Anatomical changes in Sweet Clover shoots infected with wound-tumour virus.**—*Amer. J. Bot.*, 42, 8, pp. 693–698, 13 figs., 1955.

Observations at the University of Illinois of the changes in the anatomy of shoots of *Melilotus officinalis* and *M. alba* induced by clover wound-tumour [big vein] virus [*R.A.M.*, 34, p. 832] disclosed that the tumours were generally initiated in the phloem-fibre cells, which were differentiated from the procambium, and in those of the phloem-parenchyma.

Blunck (H.). **Viruskrankheiten. Fortschritte im Wissen von ihrem Wesen und Wirken.** [Virus diseases. Advances in the knowledge of their nature and action.]—66 pp., 39 figs., 8 diags., 2 graphs, Ludwigsburg, Württemberg, Eugen Ulmer, 1955. DM. 5.80.

Following a brief introduction, recent developments in the study of virology [cf. *R.A.M.*, 34, p. 209] are critically discussed under the headings of economic importance, pathological symptoms, modes of transmission, physical and chemical properties of viruses, reproduction mechanism, and nature and origin of viruses.

Fukushi (T.) & Shikata (E.). **Electron microscope studies on plant viruses I.**—*J. Fac. Agric. Hokkaido Univ.*, 50, 2, pp. 74–94, 5 pl., 6 figs., 1955.

Electron microscope studies at Hokkaido University, Japan, revealed that many of the particles of chemically purified potato virus X (mottle strain) from tomato and tobacco were filaments 400 to 500 mμ by 10 mμ. The infectivity of tobacco mosaic virus [*R.A.M.*, 34, p. 822] suspensions heated on collodion film for 30 to 40

at 70° C. was reduced and at the same time the number of particles shorter than 230 mμ increased while those longer than 280 mμ decreased. At 80° the infectivity and particles below 230 mμ decreased still further, and small globular deposits appeared. Following exposure at 90° to 95° for ten minutes the particles became coagulated and infectivity was entirely lost. Further experiments at pH 7 confirmed that a reduction in infectivity and the number of particles longer than 230 mμ was correlated with an increase in temperature and the time of exposure.

Smith (K. M.). **Past and present trends in plant virus research.**—*Ann. appl. Biol.*, 42 (Proc. Jubilee Meeting, London, 13–17 Sept., 1954), pp. 115–121, 1955.

A brief historical review is given of plant virus research [*R.A.M.*, 35, p. 2], the points covered being the development of the local lesion technique, serology [see next abstract], latent viruses, multiplication within the vector, contemporary research on the nature of the virus particle, virus inhibition, cross-protection, and the difficulties of classification.

Black (L. M.). **Parasitological reviews. Arthropod transmission of plant viruses.**—*Exp. Parasitol.*, 3, 1, pp. 72–104, 1954.

In this review of the present knowledge of the transmission of plant viruses by insects aphid and leafhopper vectors are dealt with most fully and reference is made to white flies, mealy bugs, thrips, mites, and insects with biting mouth parts. The morphology of insect-transmitted viruses, the resistance of plants to insects, symptoms ascribed to insect toxins, and the ecology of transmission are also discussed. A bibliography of 143 titles is appended.

Report of the subcommittee on viruses (1953).—*Int. Bull. Bact. Nomencl. Tax.*, 4, 2, pp. 109–114, 1954.

At the meeting of the Virus Subcommittee of the International Nomenclature Committee [cf. *R.A.M.*, 32, p. 469] held in Rome on 8th and 9th September, 1953, reports of the study groups appointed in 1950 and 1952 were examined. The decision made in 1950 to discourage the use of classification systems and binomials for viruses was reiterated, and the postponement of a starting date for valid nomenclature for viruses was recommended. Names already proposed for viruses should have no standing in bacteriological nomenclature.

Maramorosch (K.). **Mechanical transmission of Clover club-leaf virus to its insect vector.**—*Bull. Torrey bot. Cl.*, 82, 5, pp. 339–342, 1955.

At the Rockefeller Institute for Medical Research, New York, clover club leaf virus from viruliferous *Agalliopsis novella* [*R.A.M.*, 30, p. 25] and diseased crimson clover plants was diluted and injected into 100 virus-free *A. novella*. After incubation for over four weeks six out of 22 insects receiving virus from insects and 3 out of 17 from plants were able to infect crimson clover plants. All the 100 uninjected insects remained virus-free. The success of these transmission experiments indicates that the technique could be used for the detection and study of the virus *in vitro*.

Hansen (H. P.). **The influence of saccharose on infectivity and physical properties of some plant viruses.**—*Contr. Dep. Pl. Path. roy. vet. agric. Coll. Copenhagen* 39, 18 pp., 2 figs., 1954.

The author shows that the physical properties of anisometric viruses such as potato virus Y, tobacco mosaic virus, potato virus X, and cucumber virus 1 [cucumber mosaic virus] are considerably affected by saccharose. Amongst other reactions tested the longevity of several viruses was increased, tolerance of heating

augmented, and serological reactions delayed. These effects were attributed to the dis-aggregation of the virus particles by the sugar in solution with or without the formation of virus-sugar particles.

LEGG (J. T.). **A combined aspirator and feeding cage for the collection and testing of insects as vectors of plant viruses.**—*Nature, Lond.*, 176, 4482, p. 609, 1 diag., 1955.

At East Malling Research Station an apparatus combining the principles of Kunkel's aspirator for insect collecting [*R.A.M.*, 6, p. 297] and Maramorosch's leaf-feeding cage (*J.N.Y. Ent. Soc.*, 59, p. 49, 1951) was designed to minimize insect handling. The perspex aspirator, $2\frac{1}{2}$ by $2\frac{1}{2}$ by $2\frac{1}{2}$ in., is fitted at the top with two $\frac{1}{4}$-in. glass tubes while the cage, a 2 by 1 in. polystyrene pill box, has holes $1\frac{1}{2}$ in. in diameter in the lid and base, each covered with 34-mesh nylon gauze. The cage is inserted in the aspirator so that the intake tube passes through matching holes in the lid and side of the cage. Insects are drawn through the jet into the cage and the latter withdrawn, the inlet hole closed, and a fresh cage inserted. In feeding tests the cage is fastened to a leaf. A string wick inserted in the cage absorbs the honey-dew.

BARTELS (W.). **Der gegenwärtige Stand der Forschung auf dem Gebiet der Inaktivierung pflanzenpathogener Viren, insbesondere das Tabakmosaikvirus.** [The present status of research in the sphere of plant-pathogenic virus inactivation, especially Tobacco mosaic virus.]—*Phytopath. Z.*, 24, 2, pp. 117–178, 1955.

The author's comprehensive survey and critical discussion of 94 contributions to the literature [many of which have been noticed in this *Review*] on plant-pathogenic virus (especially tobacco mosaic) inactivation is presented under the following headings: the concept of inactivation; the soil as the sum-total of factors influencing activity in the soil transmission of tobacco mosaic virus; and the influence on activity of physical factors, pH value and buffering, chemicals, ferments, sera, blood, and proteins or protein-containing substances, bacteria and fungi, and plant and insect saps, concluding with findings of general significance on the mechanism of inhibition.

SMITH (K. M.). **Some recent work on plant viruses.**—*Sci. Hort.*, 11, pp. 98–103, 2 pl., 1955.

The following perennial plants have been added to the known host range of cucumber mosaic virus [cf. *R.A.M.*, 34, pp. 131, 423, 426, 596]: privet, elderberry (*Sambucus*), and dead nettle (*Lamium*), the two last-named being symptomless carriers. In some hosts, particularly *Buddleia* [loc. cit.], the virus caused severe distortion of the leaves, which sometimes became string-like.

A virus disease of cultivated anemones [*Anemone* spp.] called 'parsley leaf' causes growing concern in the south-west of England; affected leaves were mottled, down-curved, and bunched, and the flowers distorted and of inferior quality. Two viruses, a strain of cucumber mosaic [cf. 32, p. 190] and an unidentified one are associated with the condition, but their exact relationship has not yet been established.

JACKS (H.). **Plant quarantine. IV. List of plant diseases and pests intercepted in New Zealand in 1954.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 6, pp. 608–609, 1955.

Among the plant pathogens intercepted in 1954 on nursery stock introduced into New Zealand [cf. *R.A.M.*, 33, p. 704] were *Melanconis alni* on alder, *M. stilbostoma* on birch, and *Diaporthe leiphaemia* on oak, all from England, and *Cumminsiella sanguinea* on *Mahonia* sp. from England and Holland. None of these diseases is established in New Zealand.

Pflanzenschutzbestimmungen im Ausland. Israel. Einfuhrbeschränkung für Pflanzen. Zusammenstellung des Ministeriums für Landwirtschaft, Pflanzenschutzabteilung, Tel Aviv. Dezember 1950. [Foreign plant protection regulations. Israel. Import restriction for plants. Compendium of the Ministry of Agriculture, Plant Protection Division, Tel Aviv. December, 1950.]—*Amtl. PflSchBestimm.*, N.F., 7, 3, pp. 144–147, 1954.

Among the regulations governing the entry of plants into Israel is a ban on the importation (unless for experimental or scientific purposes or in the preserved, pressed, or dried state) of *Anona* spp., papaw, *Citrus* spp. (other than fruits from Egypt), figs, cotton (except dehusked), *Hibiscus* spp., tomatoes, mangoes, mulberry plants, bananas, palms of all kinds except date fruits, avocado pears, guava and pomegranate plants, and eggplants.

Consignments of maize seed (for sowing only) must be accompanied by a certificate of freedom from infection by *Sclerospora graminicola*, while similar declarations are required in respect of seed beans [*Phaseolus vulgaris*] (*Colletotrichum lindemuthianum*), cabbage and cauliflower seed (*Pseudomonas Xanthomonas campestris*), and fresh peaches (*Clasterosporium carpophilum*).

Citrus nursery material and budwood imported for scientific purposes must be certified free from *P. X. citri* and *Sphaceloma fawcettii* [*Elsinoe fawcetti*], and similar material of mango from *Bacillus* [*Erwinia*] *mangiferae*. Guarantees of freedom from *Synchytrium endobioticum*, *Spongospora subterranea*, *Actinomyces scabies*, and *Bacillus phytophthorus* [*Erwinia phytophthora*] are requisite for consignments of seed potatoes. Should examination disclose an incidence of *S. subterranea* or *A. scabies* exceeding 10 per cent., the lot in question may be returned or destroyed.

Pflanzenschutzbestimmungen im Ausland. Insel Malta. Einfuhr von Pflanzen usw. Zusammenstellung der Vorschriften. 1953. [Foreign plant protection regulations. Island of Malta. Importation of plants, etc. Compendium of the directives. 1953.]—*Amtl. PflSchBestimm.*, N.F., 7, 3, pp. 148–149, 1954.

The entry into Malta of the following is prohibited: vine stocks, vines, fruits packed in vine leaves, half-dried grapes, and grape skins or stalks containing must or juice from all countries; trees, shrubs, cuttings, root tubers, and rhizomes of flowering plants, tomatoes, and raw vegetables from metropolitan France (including Corsica), North America (from the Panama Canal to Canada, inclusive), Belgium, Luxemburg, Germany, Switzerland, Holland, and Spain; plant soil and potatoes from the same countries; and fresh fruits and all living plants and parts thereof, except tubers, rhizomes, and seeds, from Hungary, Austria, and Rumania.

In the following cases permission for import is restricted by certain conditions: trees, shrubs, slips, cuttings, bulbs, rhizomes, seeds, fresh fruits, garden soil, and raw vegetables from all countries, dependent on the outcome of examination on arrival, the same provision applying to citrus fruits; potatoes (except from those countries on which an absolute ban is operative) must be accompanied by a certificate vouching for the absence of wart disease [*Synchytrium endobioticum*] from the zone of cultivation.

Quarantine and other official announcements. Announcements relating to flag smut quarantine (No. 59).—*S.R.A. Bur. Ent., Wash.* 183, pp. 3–4, 1955.

As from 23rd February, 1954, Germany was released from the status of a country harbouring flag smut of wheat (*Urocystis tritici*) in the Federal Quarantine No. 59 regulating the importation of wheat grain and wheat products into the United States [*R.A.M.*, 33, p. 406].

PUBLICATIONS OF THE COMMONWEALTH MYCOLOGICAL INSTITUTE

THE REVIEW OF APPLIED MYCOLOGY

subscription to the *Review* for the current volume is 60*s.* per annum, post free, payable in advance. volumes can be supplied, but the price is 70*s.* per volume, postage extra, with the exception olumes I, II, and XII, which are out of print. Volumes IV to VIII have been reprinted and are lable at 70*s.* per volume. Microfilm copies of the volumes out of print can be supplied to order.

INDEX OF FUNGI (formerly SUPPLEMENTS TO THE REVIEW OF APPLIED MYCOLOGY)

INDEX OF FUNGI listing new species and varieties of fungi, new combinations, and new names lished since the beginning of 1940 is published half-yearly. The cost of Vol. 1, Parts 1 to 20 and 2, Parts 1 to 9 (all published to the end of 1954) is 3*s.* 9*d.* each part. The subscription price is 7*s.* 6*d.* annum.

Cumulative Index for Volume I, comprising pp. 289–430, is now available at a price of 25*s.*, post free. ling-cases in buckram for Volume I can be obtained at a cost of 5*s.*, post free.

plete bound volumes of Volume I with the cumulative index are also available at a price of £5. 15*s.*

EX OF FUNGI. PETRAK'S LISTS FOR 1920–39. The following are now available: 1936–39, price 30*s.*; 2–35 (original copies in Just's *Botanischer Jahresbericht*), price 45*s.*; 1931, price 10*s.*; 1930, price 25*s.*; , price 10*s.*; 1922–28, price 40*s.*; 1921, price 10*s.*; 1920, price 10*s.*

DISTRIBUTION MAPS OF PLANT DISEASES

ERIES of maps showing the world distribution of major plant diseases is now being issued at the rate of maps each month. Of the 24 maps issued each year, six may be new editions, which in future cannot ssued free. The subscription price is 7*s.* 6*d.* per annum, post free. Back issues, in series, 5*d.* each; odd bers 9*d.* each, postage extra. Loose-leaf binders for the maps are now available, price 20*s.*, postage a. For a list of maps 1 to 282 see *R.A.M.*, **22**, p. 48; **23**, p. 80; **24**, p. 128; **25**, p. 96; **26**, p. 32; **27**, 6; **28**, p. 96; **29**, p. 112; **30**, p. 176; **31**, p. 160; **32**, p. 352; **33**, p. 654.

MYCOLOGICAL PAPERS

40. REVISIONS OF AND ADDITIONS TO INDIAN FUNGI. III. By M. J. THIRUMALACHAR and B. B. MUNDKUR. 15 pp., 16 figs., 1951. 4*s.* 6*d.*
41. STUDIES ON MICRO-FUNGI. VII. By S. J. HUGHES. 18 pp., 6 figs., 1951. 5*s.*
42. STUDIES ON MICRO-FUNGI. VIII. *Orbicula* and *Lilliputia*. By S. J. HUGHES. 27 pp., 1 pl., 12 figs., 1951. 5*s.* 6*d.*
43. STUDIES ON MICRO-FUNGI. IX. *Calcarisporium*, *Verticicladium*, and *Hansfordia* (gen. nov.). By S. J. HUGHES. 25 pp., 1 pl., 6 figs., 1951. 5*s.* 6*d.*
44. STUDIES ON MICRO-FUNGI. X. *Zygosporium*. By S. J. HUGHES. 18 pp., 9 figs., 1951. 4*s.* 6*d.*
45. STUDIES ON MICRO-FUNGI. XI. Some hyphomycetes which produce phialides. By S. J. HUGHES. 36 pp., 11 figs., 1951. 10*s.*
46. STUDIES ON MICRO-FUNGI. XII. *Triposporium*, *Tripospermum*, *Ceratosporella*, and *Tetraposporium* (gen. nov.). By S. J. HUGHES. 35 pp., 30 figs., 1951. 10*s.*
47. STUDIES ON MICRO-FUNGI. XIII. *Beltrania*, *Ceratocladium*, *Diplorhinotrichum*, and *Hansfordiella* (gen. nov.). By S. J. HUGHES. 15 pp., 10 figs., 1951. 4*s.* 6*d.*
48. FUNGI FROM THE GOLD COAST. I. By S. J. HUGHES. 91 pp., 32 figs., 1 map, 1952. 20*s.*
49. STUDIES ON MICRO-FUNGI. XIV. *Stigmella*, *Stigmina*, *Camptomeris*, *Polythrincium*, and *Fusicladiella*. By S. J. HUGHES. 25 pp., 15 figs., 1952. 7*s.* 6*d.*
50. FUNGI FROM THE GOLD COAST. II. By S. J. HUGHES. 104 pp., 49 figs., 1953. 20*s.*
51. A SUPPLEMENT TO A LIST OF PLANT DISEASES OF ECONOMIC IMPORTANCE IN TANGANYIKA TERRITORY. By G. B. WALLACE and MAUD M. WALLACE. 7 pp., 1953. 3*s.*
52. A HOST LIST OF PLANT DISEASES IN MALAYA. By A. THOMPSON and A. JOHNSTON. 38 pp., 1953. 10*s.*
53. THE PLANT DISEASES OF NYASALAND. By P. O. WIEHE. 39 pp., 1 map, 4 graphs, 1953. 10*s.*
54. THE RUSTS OF NYASALAND. By G. R. BISBY and P. O. WIEHE. 12 pp., 1953. 3*s.* 9*d.*
55. LEAF SPOT OF ALEURITES MONTANA CAUSED BY MYCOSPHAERELLA WEBSTERI SP. NOV. By P. O. WIEHE. 4 pp., 1 pl., 1953. 2*s.* 6*d.*
56. BRITISH SPECIES OF PERICONIA. By E. W. MASON and M. B. ELLIS. 127 pp., 1 pl., 43 figs., 1953. 30*s.*
57. KEY TO THE SPECIES OF PHYTOPHTHORA RECORDED IN THE BRITISH ISLES. By GRACE M. WATERHOUSE and ELIZABETH M. BLACKWELL. 9 pp., 1954. 3*s.*
58. SPECIES OF THE GENUS PARODIOPSIS FOUND IN TRINIDAD. By R. E. D. BAKER, 16 pp., 11 figs., 1955. 4*s.* 6*d.*
59. NEW SPECIES OF UREDINALES FROM TRINIDAD. By W. T. DALE. 11 pp., 11 figs., 1955. 4*s.* 6*d.*
60. A PRELIMINARY LIST OF JAMAICAN UREDINALES. By W. T. DALE, 21 pp., 1 fig., 1955. 5*s.*
61. THE GENUS CEREBELLA. By R. F. N. LANGDON. 18 pp., 2 pl., 6 figs., 1955. 7*s.*

bers are issued at irregular intervals. Until further notice a rebate of 33⅓ per cent. is allowed on new ers to those who register for all numbers as issued, the charge to subscribers to the *Review of Applied cology* being added to their subscriptions for the succeeding year, others being billed annually. A ling-case for Mycological Papers 1–25 is now available, price 5*s.*, postage extra.

publications are post free and, with the exception of Mycological Papers, all subscriptions are payable dvance. Foreign subscribers should pay by International Money Order or through the British Agents heir Bankers. Orders and correspondence should be addressed to the DIRECTOR, COMMON-

CONTENTS

AUTHORS' NAMES

SUBJECT INDEX